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ABSTRACT

To identify problems regarding economic development, the Committee for Scientific and Technical Personnel conducted an educational and occupational survey of each member country of the Organisation for Economic Cooperation and Development (OECD). The specific purpose of the surveys was to gather comparative data on the training and utilization of technicians in each member country. Major sections of each survey are: (1) The Structure of the Educational System, (2) Training of Technicians and Other Technical Manpower, and (3) Functions of Technicians. Related surveys for each of the following countries, Canada, Denmark, Spain, France, Switzerland, Yugoslavia, United Kingdom, Portugal, and Italy, are available in this issue as VT 015 716-VT 015 719, VT 015 721-VT 015 725 respectively. (JS)

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SCIENTIFIC AND TECHNICAL PERSONNEL

THE EDUCATION, TRAINING AND FUNCTIONS OF TECHNICIANS

NETHERLANDS

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DIRECTORATE FOR SCIENTIFIC AFFAIRS
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

SCIENTIFIC AND TECHNICAL PERSONNEL

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THE EDUCATION, TRAINING AND FUNCTIONS OF TECHNICIANS

NETHERLANDS

DIRECTORATE FOR SCIENTIFIC AFFAIRS

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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The Organisation for Economic Co-operation and Development was set up under a Convention signed in Paris on 14th December 1960 by the Member countries of the Organisation for European Economic Co-operation and by Canada and the United States. This Convention provides that the O.E.C.D. shall promote policies designed:

- *to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the world economy;*
- *to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development;*
- *to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.*

The legal personality possessed by the Organisation for European Economic Co-operation continues in the O.E.C.D. which came into being on 30th September 1961.

The members of O.E.C.D. are Austria, Belgium, Canada, Denmark, France, the Federal Republic of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

The Directorate for Scientific Affairs, which is responsible for the publication of the present report, has been established within O.E.C.D. to take charge of the activities of the Organisation relating to scientific research and to the expansion and rational utilisation of the scientific and technical personnel available so as to meet the needs arising from economic growth.

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PREFACE

The OECD Committee for Scientific and Technical Personnel has given considerable attention to the question of technician training and utilisation which is a key problem in the economic development of Member countries, and has on several occasions drawn attention to the need for an adequate supply of and proper training for skills at this level.

To clarify the situation as far as possible and to establish a solid base for discussion, the Committee has instituted a series of surveys in Member countries describing and analysing training conditions.

The material obtained is classified according to a standard pattern throughout, so that comparisons can be drawn between countries. The completed surveys were used as basic working documents for "Confrontation Meetings" between two or more countries. These meetings were held under a neutral chairman and were attended by teams of specialists from the participating countries. Delegates discussed each other's training systems and the various problems which arise and endeavoured to reach conclusions on questions of policy and to find solutions to technical difficulties.

The present publication, the sixth of a series, is a revised version of the working document used at the confrontation meeting between the Netherlands, Spain, Switzerland and Yugoslavia, held in Paris in December, 1965. The conclusions of this meeting and of the previous one between Canada and Denmark, are given in Appendix XII.

The report was prepared by the OECD Secretariat and the responsibility for it has been with Mr. S. Syrimis, Consultant to the Directorate for Scientific Affairs. It incorporates information already available at OECD and in particular in the original survey carried out by a joint FEANI/EUSEC(1) Committee, supplemented by on-the-spot investigation.

The Secretariat wishes to acknowledge its indebtedness to the Netherlands Educational Authorities for their help and co-operation in the preparation of this report.

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(1) FEANI: European federation of national associations of engineers. EUSEC: Conference of engineering societies of Western Europe and the United States of America.

Part One

THE STRUCTURE OF THE EDUCATIONAL SYSTEM

I. General data - The place of technical education in the educational system

1. The Dutch educational system is now undergoing considerable reorganisation. A Reform Act regulating all types of post-primary education up to university level was passed in 1963 and is expected to be fully implemented by 1968. Several rules and regulations have been devised to cover the transitional period 1963 to 1968. For the purposes of the present document the educational structure prior to 1963 will be referred to as "present" structure while the new one, as laid down by the Act, will be referred to as "planned" or "revised" structure.

2. "Private" education occupies an important place in the educational structure. The constitution of the country stresses that the education shall be free of charge but at the same time ascribes definite responsibilities to the Government and requires it to "make education an object of constant concern". It further states that the cost of private general primary and secondary education which satisfies such conditions as are prescribed by the law shall be defrayed from public funds to the same extent as the cost of public education (state or municipal). This has stimulated private initiative to such a degree that the majority of the primary and secondary schools are today run by private institutions and organisations, the most prominent among them being religious bodies (Roman Catholic and Protestant).

3. Education, with the exception of agricultural education, (Chapter XII) is centrally controlled by the Ministry of Education and Science. Compulsory education starts at the age of six and lasts eight years (age 14) but primary schooling lasts only six years and the "streaming"

13/

of pupils into the several types of secondary courses available takes place at the age of twelve. Subsequent lateral transfer is practically impossible under the "present" structure, since there are substantial differences in the curricula of the secondary courses. The new Act provides for a revision of the first year curriculum in all secondary courses, to reduce existing differences to a minimum, thus introducing a "bridge year" and postponing final streaming until the age of thirteen. The Act, which also provides for the introduction of new types of secondary schools and the structural reform of existing secondary courses, revises the rules and regulations covering both admission and final examinations.

4. In Appendix I a brief description of the "present" and "planned" types of schools and courses is given, together with a simplified diagram of the educational structure. Although the length of technical and vocational courses varies in certain cases, depending on the entry qualification and the nature of the trade, for purposes of simplicity it has been assumed as uniform in the diagram. Details of technical and vocational courses may be found under the appropriate headings and appendices.

5. The interest of the Dutch authorities has long been centred on technical and vocational education. In 1919, an Act was passed regulating this type of education while the recent Act on secondary education (1963) deals at length with the place of technical and vocational education in the school system and the structure of technical and vocational courses. It provides for the further integration of general and technical vocational education by stipulating, inter alia, that every form of vocational training should be preceded by a period of general education and that general subjects should constitute an integral part of the vocational school curriculum. Agricultural education, although under the jurisdiction of the Ministry of Agriculture, is covered by the same Act and is governed by identical rules and regulations as are also commercial, administrative, hotel and catering, home economics and other specialised forms of education.

6. Four levels of technical and vocational education are offered by the school system, namely: lower, intermediate, higher and university, each stemming out of the respective level of general education as illustrated in Appendix I. Technical education, although kept well within the framework of the educational system as a whole, maintains

close connection with the "outside world" by introducing practical work in industry as part of the intermediate and higher technical school curriculum (para.28 and 33). Apprenticeship training, which follows complementary primary education and may be regarded as an extension of the lower technical courses, is a combined effort between the educational authorities and industry.

7. The diagrams in Appendix II illustrate existing technical and vocational courses within the framework of the educational system (present and planned).

II. Educational and vocational orientation and guidance

8. Although educational and vocational orientation and guidance are not organised as part of regular school activities, there are two services under the Ministry of Social Affairs and Public Health - vocational guidance service and vocational information service - which contribute greatly to this field. The former is available in all "district employment offices" (85 at present) and deals mainly with psychological tests for individuals. The main objective of the vocational information service is to supply job information to pupils, parents and teachers through permanent or mobile exhibitions, film shows, lectures and pamphlets;this service is also attached to district employment offices and sub-offices. Apart from these governmental services there are also several private centres and institutions dealing with consultation, personnel selection and personnel rating.

9. Practical work, to facilitate the progressional orientation and initiation of the pupil, constitutes an integral part of the curriculum of the complementary primary and the lower secondary schools. In the latter, two periods a week are devoted to handicrafts for boys and needle work for girls, while a further two and two-thirds periods are devoted to home-economics for girls.

10. According to the Reform Act, the curriculum of the new "middle general secondary school" (MAVO), will be "of a general nature, although in the third (and fourth) year there may be some differentiations which, to some extent, anticipate any vocational courses to be followed

subsequently". The same principle is applied to the new "Higher General Secondary School" (HAVO). Practical work is completely eliminated from schools providing for preparatory scientific education.

III. Authorities in charge of education - Co-ordinating and planning mechanisms

11. From 1918 to 1965 education was the responsibility of the Ministry of Education, Arts and Science; formerly there was no separate Ministry of Education and the Ministry of Home Affairs was responsible. The Ministry of Education, Arts and Science had four General Directorates, as follows: (i) General Directorate for Education; (ii) General Directorate for Sciences and Higher Education; (iii) General Directorate for Out-of-School Education and Recreation; (iv) General Directorate for Arts and International Relations. However, in accordance with a recent reform (1965) the responsibility for out-of-school education, recreation and for arts has been detached from this Ministry, which is now called Ministry of Education and Science and transferred to a new ministry - the Ministry of Cultural Affairs, Recreation and Social Welfare.

12. The General Directorate for Sciences and Higher Education looks after the interests of the universities and other educational establishments at university level, while the General Directorate for Education deals with all matters concerning primary and secondary education. The latter has six departments as follows:

(i) Department for Preparatory Scientific and Secondary General Education, which deals with all forms of general secondary schools and commercial day and evening schools;

(ii) Department for Technical and Vocational Training, which handles all forms of technical and vocational training, including that at the higher level;

(iii) Department for Primary Education, which also covers supplementary primary and "lower secondary" education (see Appendix I), as well as Infant Education and the training of teachers for primary and infant schools;

(iv) Department for Socio-pedagogic Education;

(v) Department for the Legal Status of the Educational Personnel;

(vi) Department for non-vocational part-time educational institutions for young working people after school leaving age. (See Appendix III).

13. However, the Ministry of Education and Science does not handle all forms of education. Agricultural education is the responsibility of the Ministry of Agriculture; military education is in the hands of the Ministry of Defense; out-of-school education is under the Ministry of Cultural Affairs; recreation and social welfare and education in prisons and reform schools is under the control of the Ministry of Justice.

14. The supervision of education is carried out by the Ministry of Education and Science. Next to the Director General of Education there is an Inspector General of Education with a number of specialised inspectors for the several types and levels of education. For instance, there are three inspectors for the middle technical schools and three for the higher technical schools. In all the larger towns the municipalities also have their own education inspectors and the two main religious denominations (Roman Catholic and Protestant) have a number of their own nominees supervising the education provided by their institutions. The supervision of agricultural education is carried out by the Ministry of Agriculture and Fisheries.

15. Advisory bodies: At the national level there is an Educational Council which is an independent body established by law and appointed by the Crown. Its function is to advise the Minister of Education and Science, either at his request or on its own initiative, on general problems relating to education, e.g. curricula, proposed legislation, reorganisation plans, etc. The Council has four departments: higher education; secondary general and preparatory scientific; primary, including complementary primary, infant education and teacher training; technical and vocational training. The Minister is legally required to seek the advice of the Council on reports concerning the organisation of the various

types of schools and in most cases this advice is followed. Apart from the Educational Council, there are several other "private" institutions active in the educational sphere, the most important of which are the four Pedagogical Centres (one Roman Catholic, one Protestant and two general).(1) These centres are mainly concerned with educational and pedagogical research.

16. School administration: The administration of schools is entrusted to the school boards which are institutions or associations having as their main task the establishment, administration and control of one or more schools. Local authorities and the government act in this capacity in the case of municipal and government schools. The School Board is responsible for matters connected with school maintenance, the general organisation of instruction and education, financial and administrative affairs, and the material needs of the school.

17. For middle technical schools, the relative school boards are organised under three separate associations (Roman Catholic, Protestant and general),(1) which deal with educational and administrative matters of a general nature, while a common committee acts as a co-ordinating body. The school boards of technical colleges are organised under a common general association.

18. The Planning procedure: A separate planning unit is attached to the Ministry of Education and Science, but it deals with educational research rather than actual planning and forecasts. Although the Ministry does not wish to act as a central body administrating and controlling educational affairs, the importance of over-all planning is stressed in the new education Act. It is stated, inter alia, that "a condition for the foundation of any public school will be that such schools be included in the plans to be drawn up annually by the Minister of Education and Science containing those secondary schools which qualify for financing from the National Budget for the next three calendar years. When drawing up this plan, the Minister will use three different elements as a basis. He will first consider the plans submitted by private or public bodies whose aim is to promote secondary education, then the requests of municipalities and school boards, and, finally, his own estimate of the number of state schools he considers necessary".

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(1) The term "general" is used to define non-denominational institutions.

Part Two

TRAINING OF TECHNICIANS AND OTHER TECHNICAL MANPOWER

IV. Definition and grading of the technician - Standardised qualifications

19. Although there does not exist any official definition of the technician in the Netherlands, his role in industry is well understood and provision has been made for training at both lower and upper levels. Graduates of the middle technical schools (UTS = Uitgebreid Technische School) are sometimes defined as technicians; graduates of the technical colleges (HTS)(1) while having no special title, under certain conditions which include practical experience plus the writing of a thesis, may bear the title "register engineer" although there is still a certain difference in title between the above engineers and those holding technological university qualifications (para. 135).

20. According to the conclusions reached at the OECD confrontation meetings on technician training and utilisation, graduates of secondary technical schools may be classified as lower level technicians and those with a technical college (HTS) diploma as upper level technicians. Complying with the suggestions of the Dutch educational authorities, for the purpose of this document lower level technicians will be designated as "assistant technicians" and upper level technicians as "engineers". As regards the manpower above and below the technician level, the following definitions will be adopted:

(i) For graduates of technological universities = university engineer;

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(1) See Appendix I for the Dutch term.

(ii) For graduates of lower technical schools = semi-skilled worker;

(iii) For those possessing apprenticeship certificate = skilled worker.

21. There is a considerable degree of uniformity concerning the standardisation of qualifications as may be gathered from the following data.

(a) Content of courses

22. Curricula for technical courses are proposed by the school boards and are approved by the Ministry of Education and Science provided they comply with the general standards set by this Ministry. A considerable degree of uniformity is therefore secured throughout the country as regards content and length of courses. Furthermore, the associations of school boards (para. 17) co-ordinate individual efforts and safeguard uniformity.

(b) Final examination

23. Final examinations are organised and carried out individually by the schools. However, for middle technical schools, a representative of the Ministry of Education, normally the inspector concerned, should be present at the oral examinations and has the right to reassess the marking of papers. For higher technical schools, an examination committee is appointed jointly by the school board and the Ministry; this is normally composed of representatives from industry and the technical universities, with the principal of the school as chairman.

(c) Certificates and diplomas

24. Certificates and diplomas are issued individually by each school but enjoy a state-wide reputation and recognition, standards being maintained through the regular inspection of the schools and the supervision of the final examination.

V. Lower level technician courses within the formal educational system

25. Courses at the lower technician level are held by the "middle technical schools" (UTS)(1) and cover a variety of fields as indicated in Appendix IV. Most of these courses last three years, of which the final year is devoted to practical work in industry under the supervision of the school.

26. According to the present rules, admission to intermediate technical schools is granted to those who pass an entrance examination in Dutch, algebra, geometry, English and German, and hold a certificate stating they have attended at least three forms in an advanced primary school or two in a higher secondary school (HBS)(1) or gymnasium and have obtained satisfactory marks. The head-master may exempt from the entrance examinations the holders of:

(i) A recognised "advanced primary school" certificate type B (science-line), or A, provided the subjects taken at the school-leaving examination included Dutch, English, German, geography, physics, algebra and geometry;

(ii) A certificate showing they have attended at least three forms of a "higher secondary school" or a gymnasium and have obtained satisfactory marks.

Admittance to the preparatory (link) class may be granted to the holders of a lower technical school (LTS = Lagere Technische School) certificate after successful examinations in Dutch, arithmetic, algebra and geometry.

27. Curricula are somewhat theoretical in nature and include general cultural subjects, technological disciplines and workshop practice, as indicated in Appendix IV. In 43 of the 57 schools, specialisation is broad, aiming rather at imparting technical knowledge in basic industrial fields, e.g. metal-work, electrical engineering, building techniques, etc.; fourteen schools specialise in specific industrial techniques, such as printing, photography, painting, etc.

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(1) See Appendix I for the Dutch term.

28. Practical work is supplemented by actual training within industry during the final year of studies when pupils are placed by the school in several firms and are guided by the teachers. This training lasts 40 weeks and is divided into three or four periods, each of which normally covers a different section of the trade, although a certain degree of specialisation is introduced at this stage.

29. The new Act on secondary education introduces substantial changes in both the structure and level of the "middle technical school" courses which, according to information provided by Ministry officials, may be summarised as follows: (i) entry requirements will rise to a "middle general secondary school" (MAVO) certificate, although future graduates of lower technical schools (LTS) will continue to be accepted, as their standard is also expected to rise with the reform; (ii) the preparatory year will be adapted for graduates of both "middle general secondary schools" and of "lower technical schools" and will be incorporated into the course proper, the programme at this stage being diversified so as to level out inequalities due to different educational backgrounds; (iii) the normal length of courses will be raised to four years, including the preparatory year, but certain courses will last only three or even two years, depending on the trade; (iv) the practical year (third for the four-year courses) will be followed by a final school year to systematize and consolidate practical experience acquired, with relevant theory.

30. At present there exist fifty seven middle technical schools holding courses covering several fields as indicated in Appendix IV. Thirty one of these schools offer full-time courses only, four offer evening or other part-time courses, and twenty two combine both types of schooling. Only three of the above schools are administered entirely by governmental (municipal) authorities, the rest being private; however, they are all recognised and fully subsidised by the government. All middle technical schools are adequately equipped, according to minimum standards set by the Ministry of Education and Science, to meet curriculum requirements.

VI. Upper-level technician courses within the formal educational system

31. Upper-level technician courses are held by the higher technical colleges (HTS)[1] and cover several fields as indicated in Appendix V. Admission requirements according to the present rules are:

(i) Leaving certificate from an "advanced primary school" (ULO)[1] science and mathematics line or;

(ii) promotion certificate from the third to the fourth form of a higher secondary school (HBS), or;

(iii) promotion certificate from the fourth to the fifth form of a gymnasium, or Lyceum, or;

(iv) promotion certificate from the second to the third form of middle technical school (UTS).

32. No entrance examinations are normally required. Selection is based mainly on the science and mathematics marks contained in the certificate produced, supplemented, in many cases, by the results of a psychological test. At present, about 60 per cent of HTS enrolments are recruited among the "advanced primary school" leavers, 20 per cent among the higher secondary school population and 20 per cent among the middle technical school students. Candidates with full "gymnasium" or "higher secondary school" education (type B, science and mathematics line) may be accepted in the second year of the course proper (see below), while graduates of "lower technical schools" may enrol in a preparatory class.

33. The course itself, for the majority of trades, lasts four years, the third year of which is devoted to practical training within industry under school guidance.

34. Curricula, with the exception of the practical year, are rather theoretical in nature; according to the "present" rules they should comprise approximately: 14 per cent general subjects, 19 per cent science and mathematics, and 67 per cent technological disciplines and workshop practice (see Appendix V, selected time-tables).

35. Final examinations are held by examination committees appointed by the school boards and approved by the Ministry of Education (para.23).

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(1) See Appendix I for the Dutch term.

36. Wastage, through "drop-outs" during the courses, appears to be a serious problem. Although further investigation is necessary in order to establish accurate, overall conclusions, it appears that the crucial point is the transition from the first to the second year of the course proper, where "drop-outs" are in the region of 50 per cent. At the next transition point (second to third year) this proportion drops to about 30 per cent and becomes negligible thereafter. The main reason for this relatively high wastage appears to be the inability of the students to cope with the course.

37. As for the lower-level technician courses, the Reform Act on post-primary education introduces substantial changes in both the structure and standard of the upper-level courses. Although the situation is still somewhat fluid, the following principles have already been established.

(i) Entry requirements will be raised to a higher general secondary school (HAVO) certificate. By September, 1965, 13 technical colleges out of a total of 23 had adopted the new scheme; the rest are expected to follow as from the beginning of the 1966/67 school year. Advanced primary school (ULO, - B line) leavers with good marks in mathematics and physics are now being admitted to a special one-year preparatory course. Higher secondary school (HBS, - B line) and gymnasium (B line) leavers are admitted to the first year of the new style technical college course while those who have completed successfully the third year of the HBS school or the fourth year of the gymnasium course may be admitted to the preparatory year, provided they have obtained good marks in mathematics and physics.

(ii) The length of the actual courses will still be four years, excluding the preparatory one.

(iii) The third year of industrial courses will still be devoted to practical work in plants, but ample possibilities for further specialisation will be provided during the final year, as well as through additional part-time courses at post-graduate level. Certain "technical colleges" already offer such courses in several fields, including automation, nuclear techniques, management, electronics, acoustics, etc. (Appendix V).

(iv) Curriculum reform is still under consideration, and a special committee has been appointed to investigate the matter and submit concrete proposals to the Ministry of Education. It is expected that the revised curricula will be further adapted to the needs of industry and will provide for narrower specialisation on a broader basis. Furthermore, the raising of admission requirements, coupled with curriculum reform is likely to reduce "drop-outs" considerably. Curriculum outlines of the revised mechanical and electrical engineering courses will be published as a separate document, addendum to this report, as soon as they become available.

38. Opportunities for further studies for technical college graduates consist mainly in further specialised training. However, competent graduates may continue their studies at university level and qualify as university engineers usually within a period of four to five years. Possibilities of shortening this period are now being studied.

39. Courses at the upper-technician level are held by the 23 "technical colleges", 11 of which offer also evening and/or part-time post-graduate courses, as indicated in Appendix V, 2. All schools are recognised and fully subsidised by the government but only three of them are under governmental (municipal) authorities. Laboratories and workshops are adequately equipped according to the "minimum standards" set by the Ministry of Education. The average amount required to equip a school is estimated at approximately G.750,000 (1) per branch of specialisation.

VII. Vocational courses at craftsman level within the educational system

40. Craftsman training starts at the "lower technical schools" (LTS) which are three to four-year institutions offering full-time basic

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(1) 3 guilders = 1 US dollar

training in several trades such as wood (carpentry and cabinet-making), metal (fitting, blacksmithing, copper-smithing, etc), electrical fitting and installations, house painting, motor-cycle and motor-car maintenance and repair, masonry, tailoring, shoemaking, printing, bookbinding, hotel and catering, etc. Local needs determine the trades and subjects to be taught in each school but wood and metal-trade departments are to be found in practically all of them.

41. At present there are 325 "lower technical schools" with an average attendance of approximately 400 at each; the vast majority are run by private institutions and organisations. Admission may be granted to those who have passed the sixth form of an ordinary primary school. Graduates of the "lower secondary" (LAVO) or "complementary primary" schools may be accepted in the second year of the course. The curriculum comprises general subjects, e.g. languages,civics, history, geography, religion, general science, mathematics, physical training, and practical work supported by technical drawing, general technology and elements of related theory as indicated in Table 1. According to the "Reform Act" still further emphasis has to be given to general subjects during the first (orientation) year of studies.

Table 1

Distribution of General and Technical Subjects in the Lower Technical Schools

(instruction periods per week)

	1st year	2nd year	3rd year	4th year
1. General subjects	16 (50%)	13 (36%)	9 (25%)	9 (25%)
2. Technical drawing.	2	4	4	4
3. General technology	-	3	3	3
4. Practical work	14	16	20	20
Total	32	36	36	36

42. Specialisation starts at the second year but further differentiation is introduced in the third year as indicated in the example below:

<table>
<tr><td>4th year</td><td>Auto mechanics</td><td>Electrical installation</td><td colspan="3"></td></tr>
<tr><td>3rd year</td><td>Auto mechanics</td><td>Electrical installation</td><td>Metal</td><td>Wood</td><td>Painting</td></tr>
<tr><td>2nd year</td><td colspan="3">General metal</td><td>Wood</td><td>Painting</td></tr>
<tr><td>1st year</td><td colspan="5">Orientation</td></tr>
</table>

The "lower technical schools" are not expected to produce a "finished" craftsman. They provide no more than the basis for further training which is acquired either during apprenticeship or in the "secondary technical schools".

VIII. Technical courses at university level

43. Technical courses at university level are held by the "technological universities" which are state institutions offering courses in a variety of fields as indicated below:

(i) Delft Technological University - Mechanical engineering, electrical engineering, chemical engineering, civil engineering, architecture, physical engineering, rural engineering, aeronautics, metallurgy, geodesy, mathematical engineering.

(ii) "Eindhoven" Technological University - (founded in 1957) - Mechanical engineering, electrical engineering, chemical engineering, physical engineering, mathematical engineering.

(iii) Twente Technological University - (founded in 1964) - Mechanical engineering, electrical engineering, chemical engineering.

44. Admission to the technological universities is by examination for candidates possessing a "B" type (science and mathematics line) certificate of "preparatory university education" (gymnasium, atheneum, lyceum); under the "present" rules graduates (B certificates) of the modern grammar schools (HBS) are also eligible.

45. The standard length of courses is five years but the majority of students complete their studies in six to seven years. In all faculties students must sit for three examinations, the propaedeutics, candidates' and engineers' at the end of the second, fourth and fifth years respectively, at the earliest. Graduates have the title of "university engineers", which is claimed to be the equivalent of a master's degree (M.Sc.) by British standards. The new technological university at Twente has introduced a shorter course ($3\frac{1}{2}$ years) leading to an inter-

mediate degree equivalent to a B.Sc. (Bachelor of Science). Graduates of the "technical colleges" (HTS) are exempt from various parts of first and second stage examinations and may thus complete the course in four or five years.

46. The curriculum is theoretical in nature with a strong scientific and mathematical background. The first two years of studies are common to several branches but at the end of the second year a first differentiation is introduced prior to further differentiation during the final year. The total number of universities and faculties available in the Netherlands is given in Appendix VI.

IX. Technical teaching staff

47. The educational system recognises four categories of teachers in technical schools: for general education subjects; for mathematics and sciences; for technological subjects and drawing; workshop instructors.

(a) Recruitment and training

48. Teachers for general subjects, sciences and mathematics, are trained in the same way as those for the corresponding levels of primary and secondary general schools. Teachers for technical colleges should normally possess a university degree supplemented by professional qualifications; a teacher-training (primary) certificate is adequate qualification for teaching at "lower" and "secondary" technical schools.

49. Candidates for teacher-training courses are recruited mainly among the "present" advanced primary school leavers and are trained in special colleges. The course lasts five years and is divided into three cycles of two, two, and one year respectively. Graduates of the second cycle are qualified to teach in an ordinary primary school but a third cycle certificate is necessary to teach general subjects in an "advanced primary", "lower technical" or "secondary technical" school. Additional "subject studies" are required for the teaching of special subjects such as science or mathematics. All "qualifying" examinations, including

those for the "additional subjects" certificate, are centrally controlled by the State.

50. The Dutch authorities have shown particular interest in developing an efficient system of training for technical teachers. Activities in this field started as early as 1964 by private initiative, which led to the establishment (1953) of the "Association for the Training of Teachers for Industrial Education". This Association is fully subsidised by the Government and is responsible for the training of technical teachers under the supervision of the Ministry of Education. It has two main sections: one for planning and developing curricula for "lower" and "middle" technical schools and for technical-teacher training courses, and one for organising vocational and technical school examinations. The government inspector for teacher training is the chairman of the examinations' section.

51. Training courses for technical subject teachers and workshop instructors are virtually identical. A brief description of the arrangements now in force is given below:

(i) Entry requirements

52. Admission to the course proper may be granted to graduates of the "advanced primary schools" (ULO) or to those possessing a certificate of completion of the third form of a "higher secondary school" (HBS). Candidates not possessing either of these certificates may still obtain admission to technical-teacher training courses by taking a special two-year evening course and passing the examination for the "certificate of required general education for industrial education" (bewijs van voldoende algemene ontwikkeling, NO). These courses are given at various technical schools and are arranged on behalf of the Netherlands Association for the Training of Teachers for Industrial Education.

53. Vocational instructors should have normally completed a two-year period of apprenticeship and passed the state technical certificate examination for their trade. No further proof of practical skill is required before taking the final state examination for the pedagogical certificate in technical education.

(ii) Length and content of courses

54. The course proper is a part-time evening course and lasts six years. It is divided into four phases: Elementary (2 years); further (2 years); final (1 year); pedagogical-didactic (1 year).
55. Alternative part-time day courses are also available for the second (further) and fourth (pedagogical-didactic) phases. Further details on the structure and content of courses may be found in Appendix VII, together with examples of time tables.

Special courses in both pedagogical and technical subjects - new materials, measuring methods, visual aids, electronics, organisation and management of technical schools, teaching techniques, etc. - are also available. Their purpose is to help keep technical teachers up to date on new developments in their fields of technical specialisation and in pedagogics.

(iii) Examinations

56. At the end of the elementary and further training stages of the basic teacher-training course, examinations have to be passed for admission to the next stage of training. At the end of the one-year final phase the student-teacher sits for a government examination (staatsexamen), which concludes his technical training. For admission to this examination the candidate must prove that he has worked for at least four years in the trade he intends to teach. He must have acquired this practical experience after 1st January of the year in which he reached the age of 17.
57. To gain full recognition as a technical teacher, after completing the pedagogical/didactic stage of the basic teacher training course, the student-teacher must also pass a State examination for the pedagogical certificate for technical education.

(iv) Present training facilities - Requirements

58. There exist at present fourteen evening and two day-time technical-teacher training institutions, most of them attached to technical schools.

59. In 1961, there were 6,172 student teachers registered as attending teacher-training courses. Of these, 2,765 (almost 45%) were in the elementary stage and only 292 (just under 5%) were in their final year of pedagogical-didactic training. As a whole, they were evenly divided into those training to become workshop instructors and those who would be teaching technical subjects.

60. In March 1961, there were 6,974 elementary and 725 intermediate technical education teachers, making a total of 7,697. Of these teachers 25 per cent were for general education, 10 per cent for science, 20 per cent for theoretical/technical subjects and 45 per cent for workshop practice. The theoretical/technical subject teachers and the workshop instructors together make up 65 per cent of the entire technical/vocational education teaching staff and represent a teaching strength of approximately 5,000 technical teachers.

61. Taking into consideration that there is an annual loss of 3 per cent, the need for vocational teachers may be estimated at 215 per annum which can be easily covered by the existing facilities. However, about 20 per cent of the present teaching staff has not yet had any formal training and there is an increasing demand for supplementary training (refresher courses, etc.).

(v) Alternative routes to technical teaching

62. For a number of subjects, persons may be recognised as technical teachers without having followed the training outlined above.

1. Graduates of technical colleges (HTS) may be accepted as teachers at schools for lower and intermediate technical education, provided that: (i) after graduating from a technical college they have had at least three years' practical experience in their trade specialisation; and (ii) they possess the pedagogical certificate for industrial education.
2. Graduate engineers may be accepted as teachers of mathematics and science immediately after graduating and as teachers of technical subjects, after at least three years' post-graduate experience in their trade specialisation.

(b) Status and salaries

63. Status and employment conditions of technical-teachers are more or less equivalent to those of the teaching staff at comparable level in general education schools, and compare favourably with those of persons with equivalent qualifications occupied in industry. Table 2 below gives the minimum and maximum monthly salaries for directors and teachers at "lower" and "middle" technical schools. In practice these salaries vary according to: the classification of the community in which the school is located; the teacher's seniority; the number of subjects he is qualified to teach; and, for directors, the size of the schools.

Table 2

Salaries of technical teachers per month
(in guilders) (1)

	Lower technical schools		Middle technical schools	
	Men	Women	Men	Women
Director	689 - 1,185	534 - 1,020	889 - 1,235	589 - 1,020
Teachers	489 - 980	414 - 810	534 - 1,025	454 - 880

(1) 3.58 guilders = 1 US dollar.

Source: Training Vocational Teachers (Ministry of Education and Sciences, 1964).

64. Various allowances, amounting to 6.5 per cent of the salary, should be added to the figures mentioned above. Technical teachers may be promoted to higher category schools or to inspectors, members of government examination commissions, or deputy directors of schools.

X. Training outside the formal system

(a) Apprenticeship

65. Apprenticeship training is administered by private bodies under the supervision of the Ministry of Education and Science. The Technical Education Act (1919) divides technical education into "school education" and "apprenticeship education" and empowers the Ministry of Education and Science to delegate the direct control of the latter to industrial organisations. The Act also provides for substantial financial help to such training organisations and to the enterprises where apprentices are trained.

66. A characteristic feature of apprenticeship training in the Netherlands is the close co-operation between employers and employees in this field. The so-called "Foundation of Labour" which is a joint employer-employee association established secretly during the second world war when the occupation authorities prohibited trade union activity, suggested in 1945 that each branch of industry ought to have its own organisation for the promotion, development and application of apprenticeship. This led to the establishment, during the period 1945 - 1961 of central joint (employer-employee) training organisations in practically all branches of industry, e.g. engineering, textiles, building trades, chemical industry and printing. The "Foundation for Vocational Training in the Metal and Electro-technical Industry" (BEMETEL) and the"Foundation for Vocational Training in the Building Trades" (SVB) are two of the biggest organisations of this kind. The various training organisations co-operate in a "Central Training Association".

67. Apprenticeship is the principal method used for training skilled labour, and may start at the age of 14, i.e. immediately after the

compulsory schooling period and completion of the "complementary primary school", although the main source of recruitment of apprentices is the "lower technical school" which has a three or four-year course following six years of primary schooling.

68. The length of training varies from two to five years according to the trade and the background education of the apprentice. For instance, in the metal and electro-technical industries, the training of an apprentice-turner takes two years if he has followed a lower technical school course and three years otherwise, while the training of a tool-maker takes three years for trainees from lower technical schools and four years for others. Furthermore certain training organisations, e.g. the SVB (building trades) divide their training into two stages, namely, the "ordinary" which lasts two or three years and produces the semi-skilled workers, and the "advanced" which lasts another two years and produces skilled labour.

69. The training programmes are set by the training organisations and approved by the Ministry of Education. Apprentices, apart from their on-the-job training, are obliged to attend special evening or day-release classes, usually held by the "lower technical schools". The frequency of these classes varies with the trade but normally does not exceed twelve lessons per week. The content of the programme is directly adapted to the individual needs of each trade but the modern tendency, expressed in a statement of the BEMETEL, is that "more attention should be paid to general education .... it is our responsibility not only to give these youngsters the necessary technical training, but also to prepare them to live in a democracy and to play the role each individual has to play according to the rules we set ourselves ...". School teaching is supervised by one of the inspectors of the Ministry of Education. On-the-job training is carried out by instructors provided by industry and is supervised by special "consultants" hired by the training organisations.

70. Apprentices, on completion of their training, sit for final examinations which are identical for all trainees of the same trade and are organised and set by the training organisations. These examinations comprise practical and written work, and the results are judged according to identical rules and standards by a panel of examiners who are appointed by the Ministry of Education on the recommendation of the training organisations. Successful candidates receive a diploma stating

the craft, trade or occupation for which they have been trained. Apart from this diploma, a certificate is issued to the trainees by the school at which they had successfully completed the class-room education. The diploma and the certificate are quite independent of each other, although only jointly do they guarantee a balanced education.

71. The legal basis for apprenticeship is a written contract between the employer and the apprentice or his legal representative. The training organisation normally countersigns the contract, thus accepting the responsibility of seeing that both parties keep to its regulations, the most important of which are:

(i) The employer is required to provide the apprentice with a proper course of training that meets the requirements of the training programme prescribed by the Ministry of Education and Science for the particular craft, trade or occupation in which the apprentice is specialising;

(ii) Apart from practical training, the apprentice is required to attend general and vocationally-based classes as specified in the contract;

(iii) The apprentice is required to write up carefully the "job book" which he receives from the organisation, in accordance with instructions laid down by the board.

72. The Ministry of Education pays the operating costs of the training organisations for apprenticeship in the strictest sense of the word. This includes, for instance, salaries and travelling expenses of consultants and staff, the cost of examinations, etc. but excludes all special courses, the design of teaching media, etc. The Ministry also pays each firm Guilders 1,115 to 1,200 per week for each apprentice. The tuition fee is Guilders 1,015 per week, but it is usually paid by the firms themselves.

73. On January 1st, 1963, there were approximately 60,000 apprentices with an apprenticeship contract and 30 central and 11 regional training organisations in operation.

(b) The Ministry of Economic Affairs

74. A balanced growth of the country's economy is of vital interest to Dutch "medium and small business" and conversely, an efficient small business is essential to the national economy of the Netherlands. Government policy therefore pays particular attention to this economic sector and the Ministry of Economic Affairs, in collaboration with the Ministry of Education and the appropriate employers' associations, initiates special courses to promote the commercial knowledge and professional ability of future business owners up to the level required by the "Small Business Licensing Act" adopted in 1937 and revised in 1954. This act provides, inter alia, for the establishment of a special order for each trade, describing in detail job requirements and the design of a special course to cover these requirements. In many cases, existing courses in technical vocational and commercial schools are considered as satisfactory. Whenever such courses are not available, special courses are organised and run by the appropriate employers' associations (on the approval of the Ministry of Economic Affairs), financed and supervised by the Ministry of Education. Usually they are of the "apprenticeship" type and may last four to seven years depending on the trade. Some of these courses fall within the "technician" grade. The final examinations are supervised by the Ministry of Economic Affairs and a certificate is granted stating the holder as capable of owning and running a specific type of "small business".

75. In the Netherlands, of approximately 380,000 establishments in trade, industry and services (excluding agriculture and fisheries) some 360,000 or nearly 95 per cent may be classified as medium or small business. In all, about one million persons are employed in medium and small businesses, i.e. approximately 23 per cent of the active population.

(c) The Ministry of Social Affairs and Public Health

76. The "department of vocational training" in the Ministry of Social Affairs and Public Health is responsible for the vocational training of adults. The lack of good training during the second world war and the subsequent rapid growth in industrialisation has created a tremendous need of skilled workers in most trades. The vocational training of adults,

which started in 1945 in a number of training centres, spread out over the country in line with regional needs. This training was considered as a social measure to make unemployed adults less vulnerable to economic vicissitudes. The partial switch-over from farming to industry, the repatriation of thousands of persons from the former Dutch East Indies, and the increasing amount of mechanisation and automation were among the many reasons for continuing vocational training and retraining of adults, unknown in the pre-war period.

77. Since 1945, approximately 63,000 adults have been trained in the building or metal industry. Investigations have shown that about 92 per of them were subsequently engaged in the trade for which they were trained, thus proving that the vocational training of adults is based on sound economic and social principles.

78. At present, there are 24 training centres providing courses for approximately 2,600 trainees (aged 18 - 50) in 21 trades. The level is that of the semi-skilled worker (various grades) and may be considered as introductory to apprenticeship (para.80). The courses are intended for: (a) persons who have had no previous occupational training and (b) for those who are unable to work in the job for which they were trained as a result of a fall in demand or a physical handicap, etc. A course for a specific trade is set up only if those provided under the Technical Training Act prove to be inadequate.

79. Before a prospective trainee is admitted to a course, he has to take an aptitude test in any one of the employment offices distributed over the country (para. 8). During the test it is decided whether the candidate is capable of following a course at one of the training centres and, if so, at which level. The length of the courses varies considerably (14 to 57 weeks full-time) depending on the intelligence of the individual and the nature and level of the trade.

80. At the completion of the course, each trainee is interviewed by the employment officer, who makes it clear that the knowledge acquired will need to be supplemented. The trainee is then advised to study for an examination held under the apprenticeship system. Although many trainees, after a certain amount of extra study, are able to pass these examinations, others for reasons of age, or other causes, are not able to sit for them. These trainees are allowed to sit for the examination held by the vocational training centre, which takes place after the trainee has been working for about a year at his new trade. Successful candidates are awarded a certificate.

81. The teaching staff for the training centres is recruited from among skilled craftsmen with long industrial experience and is supplemented by a special short course (2 weeks) on teaching methods and techniques held by the Ministry of Defence.

82. Trainees who wish to follow a vocational training course are paid compensation for loss of earnings, a travelling allowance and, in certain cases, the cost of board and lodging.

83. Co-operation between the government and industry in respect of vocational training for adults is considered very important. The "National Advisory Committee to the State Labour Office", which is composed of employers' and workers' representatives and experts, gives advice on matters of general policy. Through this committee organised industry expresses its views on the extent of the training facilities, the number of trainees who, in view of the general situation of the labour market, should be trained each year, on the trades for which training should be provided and to what extent, etc. A sub-committee on vocational training, composed of experts representing employers and employees in industry, makes recommendations regarding the subject matter of the courses and other questions related to the work of the vocational training department. Regional advisory committees are also attached to each training centre.

(d) The Ministry of Agriculture and Fisheries

84. The Ministry of Agriculture and Fisheries is responsible for agricultural education and training at all levels (paras.95 to 119).

(e) Courses held by non-governmental organisations

85. Co-operation between the government and private institutions and organisations is such that in the majority of cases governmental and non-governmental activities in the field of technical and vocational education and training are thoroughly integrated. The vast majority of the technical and vocational schools belong to private, religious or industrial organisations while the apprenticeship scheme is administered by joint employers-employees training organisations (para.66). Similar

arrangements are in force for correspondence courses (see (g) below) and several other educational and cultural activities. Several large enterprises are actively engaged in matters relating to vocational education and training. A few of such examples are given in Appendix VIII.

(f) Adult education

86. Vocational education for adults is entrusted to the Ministry of Social Affairs and Public Health, as described in (c) above. A number of other private organisations and institutions, normally subsidised by the municipalities, organise various activities intended mainly for the cultural development of adults.

(g) Correspondence courses

87. Education through correspondence courses is well-developed in the Netherlands. Several private institutions, including the "Royal Technical Institute PBNA" and "LOI" (1), run technical and/or general courses covering a large variety of fields and levels. Correspondence courses approved by the Ministry of Education and Science are fully subsidised and are supervised by a special inspector of the Ministry.

XI. Commercial education

(a) Full-time day-school commercial education

88. Commercial education in schools in the Netherlands dates from

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(1) PBNA = Polytechnisch Bureau Nederland, Arnheim (Polytechnical Bureau of the Netherlands, Arnheim).
LOI = Leidse Onderwijs Instellingen (Leiden Educational Establishment).

about 1870, although it is considered as part of general education rather than vocational. Pupils leaving schools where commercial or economic subjects are taught have virtually no practical experience whatsoever. At present there are only two types of full-time day commercial schools:

(i) The secondary commercial day-school, which was legally established in 1937, offers a three- or four-year course following six years of primary schooling. In addition to a number of general subjects, the more commercial subjects such as commercial correspondence, book-keeping, commercial arithmetic, commercial law and business economics, are taught in the upper classes together with mother and foreign languages (Dutch, French, German, English). In 1963, there were only 12 secondary commercial day-schools and six departments, with a total enrolment of 2,377 pupils.

(ii) The Retail-Trade school which is a four-year type of secondary school legally established in 1955. It is the only school providing the type of economic training laid down in the Industrial Education Act. Its purpose is to train pupils who wish to set up for themselves later in the retail trade or to take managerial posts, for instance, in multiple stores. The commercial subjects, which are not taught until the second year of the course, are: Dutch, commercial correspondence, book-keeping, commercial arithmetic, commercial practices, commercial law, applied economics, knowledge of commodities, salesmanship, advertising theory and window dressing. Final examinations are conducted by special committees appointed and supervised by the Ministry of Education and Science. The same applied to the final examinations for the secondary commercial day-schools. In 1963, there were 20 such schools with a total enrolment of 4,680 pupils.

89. Commercial subjects are also taught at elementary level in the "advanced primary schools" (ULO) and constitute an integral part of the curriculum of the present "A" stream of higher secondary schools (HBS). In the fourth and fifth years of HBS, special attention is paid to economic subjects, tuition being given in book-keeping, commercial arithmetic, business economics, commercial law, economic geography, economic history and commercial correspondence in Dutch, French, German

and English. In 1963, there were 325 "A" higher secondary schools, most of which were combined with "B" schools, and with a total enrolment of 92,407 pupils.

90. The new Act on secondary education provides for the development of commercial education along similar lines to those adopted for technical and vocational education, i.e. the introduction of elementary, intermediate and higher secondary-level commercial education corresponding to the craftsman, lower-level technician and upper-level technician, respectively.

(b) University-level commercial education

91. Commercial education at university level is given by the faculties of economics of the Groningen and Amsterdam universities and the Economics University in Rotterdam (Neutral) and Tilburg (Roman Catholic). Candidates must pass an entrance examination and be graduates of gymnasia (A line) or the "present" higher secondary schools (A line).

(c) Evening commercial courses

92. Secondary commercial evening schools, with either a three-year or a five-year course, were legally established in 1937. At present, about 150 such schools provide from nine to twelve hours' tuition a week for more than 20,000 pupils in Dutch, French, English and German, in commercial correspondence in these languages, book-keeping, commercial arithmetic, law and social legislation, typing and shorthand. Pupils must be above school-leaving age and, as a rule, be working in commercial or industrial concerns. Final examinations are conducted, for the day-schools, by special committees under government supervision. Successful candidates receive a certificate.

(d) Private commercial education

93. In the private field there are numerous establishments which

train young people who are employed in the accounts' departments of firms and institutions, for "commercial practice" certificates in book-keeping, foreign languages and modern industrial accountancy. In 1963, the principal examining organisation, founded in 1941 by the teachers' organisations, examined 38,430 candidates for the various certificates. A special form of out-of-school commercial education is also provided by institutes that coach those wishing to obtain the tradesman's certificate in accordance with the "small business licensing Act" (para.74). In 1963, 22,000 candidates sat for such examinations. Some had been coached in private courses and others in those subsidised by the government.

(e) Contact centre for education and industry

94. As for technical education, co-operation between government and industry is close in the field of commercial education as well. In 1955 the contact centre for Education and Industry was established on the initiative of the Royal Shell Group, the Central Social Employers' Union and the Council of Masters in secondary and grammar schools. Practically all the schools in that category, including high schools "A" and secondary commercial day schools, are in touch with the centre which organises: (i) teachers' meetings; (ii) study weeks and visits to industrial and commercial concerns; (iii) vocational guidance lectures and publications; (iv) holiday courses.

XII. Agricultural education

95. Agricultural education in the Netherlands is under the jurisdiction of the Ministry of Agriculture and Fisheries. However, it is organised along similar lines to those adopted for technical and vocational education and is covered by the new Act on post-primary education. On the financial side provincial authorities contribute towards the cost of this type of education in addition to the usual grants allocated by State and municipal authorities.

(a) Elementary agricultural education

96. Elementary, or lower secondary, agricultural education corresponds to the lower technical school (craftsman) level and is provided at the elementary agricultural and horticultural schools. The aim of the former school is to provide future farmers and farm workers with a general education and professional training, while that of the latter is to provide an elementary knowledge of one or more crops of importance to the region in which the school is located. Admission requirements are six years of primary schooling but pupils must be able to prove that, on leaving the school, they will earn their living in agriculture.
97. Training takes four years and the curriculum comprises general subjects, vocational knowledge, practical work and elementary bookkeeping. The final certificate testifies that the pupil has attained satisfactory marks. Pupils come mainly from small agricultural holdings and return again to their own farms after finishing school. In 1964, there were 255 elementary agricultural and horticultural schools (148 agricultural, 62 horticultural and 45 combined) providing courses for 17,857 pupils. However, the number of these schools is diminishing from year to year, owing mainly to increasing mechanisation in agriculture and the switch-over from the agricultural to the industrial sector of the labour force.

(b) Intermediate secondary agricultural education

98. Although agricultural education at this level is classified by the Ministry of Agriculture as "lower secondary", for the purposes of this document it will be defined as "intermediate secondary" since it corresponds exactly to the "intermediate technical education" level (lower-level technician). Intermediate agricultural education is provided by the middle secondary agricultural, horticultural and forestry schools.

(i) The middle secondary agricultural school aims at giving future farmers the necessary general and theoretical agricultural knowledge. This form of education takes into account the special nature of farming in the region in which the school is located. Candidates for this type of education must: (1) be 16 years old; (2) have sufficient practical agricultural knowledge; (3) take an entrance examination, unless they have reached the third form of a higher secondary school (HBS) or have spent three years in an advanced primary school (ULO "A"); (4) have done practical farm work for 12 consecutive months if possible.

99. The training takes three years. During summer the pupils undertake practical farm work, combined with a few theoretical lessons under the school's supervision. The curriculum comprises a few hours per week of general subjects (Dutch, mathematics and physical training), elementary book-keeping, and a large number (20) of special subjects such as botany, zoology, physics and chemistry geared to rural sciences, fertilising, land development, livestock feeding, etc.

100. Holders of a certificate from this school can continue their education at the "middle secondary school for forestry" (see (iii) below). In 1964, there were 35 secondary agricultural schools with a total enrolment of 3,377 students.

(ii) The middle secondary horticultural school provides students with secondary education in one or more branches of horticulture.

101. Admission requirements are not the same for all the schools. Pupils must have had at least "advanced elementary education", but some years of secondary education (HBS or gymnasium) are strongly recommended. Recently, the schools have insisted that pupils should come from horticultural areas and have at least one year of practical experience.

102. The length of the course varies from two to three years, and the curriculum comprises general subjects, foreign languages and special subjects as indicated in Appendix IX (time tables for a secondary horticultural school). Holders of the first certificate can find employment with the various State, provincial and municipal services such as plant protection, public parks, horticultural institutions. In 1964, there were ten middle secondary horticultural schools with a total enrolment of over 1,000 pupils.

(iii) The middle secondary school for forestry and rural engineering of the Netherlands Land Development and Reclamation Society (private firm) prepares students for a secondary-level job in forestry and land development. Candidates wishing to enter this school must take an entrance examination, have reached the fourth form of an advanced (B) primary school (ULO) and possess a certificate from a secondary agricultural school (see (i) above), or must have followed an equivalent form of vocational training with specialisation in forestry or land development.

(c) Higher secondary agricultural education

103. Higher secondary agricultural education corresponds to the "upper technician" level and is provided by the higher secondary agricultural, horticultural, forestry and other special schools.

(i) The higher secondary agricultural schools prepare students for both practical farming and agricultural employment, and also provide a general education, considered as equivalent to that of the two last forms of the present higher secondary school (HBS).

104. Candidates must be at least 15 years of age and have reached the fourth form of a "B" higher secondary school (HBS), the fifth form of a gymnasium, or possess the final certificate of an "advanced primary school" (ULO "B"). Practical farming work for at least one consecutive year is desirable.

105. The course lasts three years and training is divided into a winter (September-April) and a summer (April-July) term. In between pupils do practical farmwork.

106. The curriculum comprises general and economic subjects, and a number of special agricultural subjects as indicated in Appendix IX (time table of a higher agricultural school).

107. With a diploma from one of these schools, graduates may enter the agricultural university and the veterinary faculty of the State University of Utrecht, or be admitted to training courses for agricultural teachers. Holders of this diploma are qualified to manage large agricultural enterprises or may find employment with various government and private institutions or societies. In 1964, there were six higher secondary agricultural schools with a total enrolment of 1,284 students.

(ii) The government higher secondary school for tropical agriculture is a special type of agricultural school at Deventer, and provides students with a thorough training in tropical and sub-tropical agriculture together with a good general as well as practical vocational training.

108. Entry requirements are identical to those for other higher secondary agricultural schools and the course also takes three years. In addition to the general curriculum, the school offers special courses such as the cultivation and processing of sugar (cane and beet); annual and perennial tropical and sub-tropical crops, etc.

(iii) The higher secondary horticultural schools prepare students for executive functions at secondary level in horticulture. Admission requirements are identical to those for higher agricultural schools but the course lasts four years. During the third year, students must do practical work for a period of 7 to 8 months. Graduates from these schools are allowed to go on to the State agricultural university, and are eligible for directorship at co-operative institutions or executive posts in industries processing horticultural products.

109. There are, at present, two horticultural schools at this level: the higher secondary horticultural school at Utrecht and the higher secondary horticultural school at Frederiksoord. The curricula of the two schools are not quite identical. For instance, students at Frederiksoord may specialise in three of the following six branches: landscape gardening, fruit growing, vegetable growing, flower growing, arboriculture, and seed growing, while the school at Utrecht provides a less specialised training.

In 1964, a total of about 300 students attended these horticultural schools.

(iv) The higher secondary school for forestry and rural engineering at Arnheim, belongs to the Netherlands' Land Development and Reclamation Society (a private concern), and prepares students for higher and medium positions in forestry and rural engineering.

110. Admission requirements are identical to those for the higher secondary agricultural schools although there is an entrance examination, except for candidates holding the final certificate of a "B" higher secondary school (HBS) or equivalent, who must take a psycho-technical test.

111. Training takes four years and covers practical work and related

theory. Specialisation (forestry or rural engineering) is introduced after the second year. Graduates can apply for jobs with the State Forestry Service, Forestry Institutions, Public Lands Administration, Municipal Public Park Departments, rural engineering firms and private landowners in the Netherlands and abroad.

(v) The higher secondary dairy schools provide a thorough training in dairying and associated subjects. At present, there are two such schools, one at Bois-le-Duc, and another at Bolsward. Admission requirements are identical to those for the higher (secondary) agricultural schools, although one of the schools also requires candidates to pass an examination to show they have practical experience in dairying.

112. The length of the course is four years and graduates should be capable of acting as assistant or managing directors of dairy factories and also carry out various secondary functions in the dairy industry. They are also eligible for admission to the State University at Wageningen and the veterinary faculty of the State University at Utrecht.

(d) University agricultural education

113. Agricultural education at university level is provided at the agricultural university at Wageningen, which is both a training centre and a research institute. The training is designed so that graduates may either act in an independent capacity or occupy professional posts in agriculture requiring university training. Candidates for admission hold either a final secondary school certificate (gymnasium, or HBS "B") or a final certificate from a higher agricultural, horticultural, dairying, or forestry school.

114. The course comprises three distinct parts:
(i) preparatory (about one year); (ii) intermediate (at least two-and-a-half years); (iii) final (two years or more, depending on the practical training required). Each part includes a terminal examination. The course usually takes from five to seven years. At the beginning of the intermediate section (ii) the student may choose from among 22 different branches, namely: field crop and grassland husbandry; tropical

field crop husbandry; animal husbandry; tropical animal husbandry; dairying; horticulture; forestry (sylviculture); forestry (forest utilisation and economics); agricultural economics; agricultural economics in the tropics; land development; land development in the tropics; landscape gardening; plant breeding; phytopathology; pedology and agricultural chemistry; agricultural engineering; agricultural technology; rural sociology; rural sociology of non-western region; rural home economics, technical branch; rural home economics, socio-economic branch.

115. Graduates of the final examinations at the end of the course receive the degree of "Landbouwkundig Ingenieur", i.e. Graduate of the Agricultural University (Master of Science) or Agronomist. Holders are eligible for posts as agricultural and horticultural teachers, government agricultural and horticultural extension services, the government service for the utilisation of land and water, private agricultural or horticultural enterprises and societies either in the Netherlands or abroad. Graduates may obtain the degree of Doctor of Agricultural Science after presenting a thesis showing the results of research work.

(e) Special agricultural schools and courses

(i) Vocational agricultural schools

116. Vocational agricultural and horticultural schools provide practical education at lower and intermediate secondary levels covering special subjects such as practical engineering, poultry farming, fruit growing, plant protection, etc. Length and admission requirements vary with the nature and level of the course. At present there are 11 agricultural and 86 horticultural vocational schools.

(ii) Agricultural and horticultural courses

117. These can be divided into: (1) preparatory courses, to facilitate gradual transfer from the primary school to the general agricultural course; (2) general courses teaching basic agricultural or horticultural techniques; (3) special courses providing instruction in the special branches of agriculture or horticulture. Admission requirements vary with the nature of the course. The length is one winter term for

general agricultural courses, and two winter terms for either the special agricultural or the general and special horticultural courses.

(iii) Training of agricultural and horticultural teachers

118. The teaching staff of the intermediate and higher secondary agricultural schools is mainly recruited among graduates of the agricultural university. Various courses exist to prepare students for certificates entitling them to teach at the lower secondary agricultural education level. The requirements differ and the length varies from a few months to about three years for each course.

XIII. Hotel and catering training

119. Hotel and catering education in the Netherlands is under the jurisdiction of the Ministry of Education and Science: At present courses are available at only the "lower secondary" (craftsman) and post-secondary (upper technician) levels.

120. Lower secondary hotel and catering courses are normally held by special schools or departments (15 at present) of the "lower technical schools", and cover several branches such as cooking, serving, etc. The courses, which last three years and require a six-year primary schooling, open the way to apprenticeship training.

121. Higher secondary hotel and catering courses are held by special hotel-schools and cover the middle level occupations in hotels, restaurants and cafes. They provide the basis needed for attaining the highest functions after further practical experience. Admission requirements are at least an "advanced primary school"(ULO) certificate,and the length of the course is three years. Graduates of "higher secondary schools" (HBS) may be admitted to the second year of the course.

122. Training comprises: (i) practical work, familiarity with, and dexterity in kitchen activities and table-waiting; (ii) technical training, such as food preparation, menu planning, knowledge of non-alcoholic and alcoholic drinks and wines, dietetics, food selection

and purchase, hotel management, health and hygiene; (iii) knowledge of foreign languages, correspondence; (iv) commercial subjects such as book-keeping, hotel administration, cost accounting, economics, law, wage and labour conditions, public relations and sales promotion, advertising and tourism, typing and, for women students only, shorthand and interior decoration. Practical work is carried out in hotels and restaurants attached to the schools and is supplemented by actual placement during vacation periods.

123. Final examinations are conducted by the schools under the supervision of the Ministry of Education and Science. Graduates are considered to possess adequate practical experience, and to be apt to fulfil the functions of "commis de rang", cashier, assistant steward, etc. and to have acquired both the basic theoretical knowledge and practical experience making them apt for higher functions at a later stage.

124. The technical teaching staff is normally recruited among experts in the field with long practical experience supplemented by special pedagogical training (last year of the special technical teacher training course described.

125. At present there are only two hotel-schools at higher secondary level, one run by the Dutch Hotel and Restaurant Association and the other by the Roman Catholic Church. Both have residential facilities for students and are recognised and fully subsidised by the government.

Part Three

FUNCTIONS OF TECHNICIANS

XIV. Technicians and their occupations

(a) General remarks

126. Graduates of technical colleges (HTS) enjoy a high reputation in industry and trade; they are occupied in research and design departments, workshops, commercial enterprises, assembly rooms, economic and organisation departments. After some experience, they may be promoted to heads of technical departments, or to administrative posts. The level they may reach has practically no other limit than their own abilities and the possibilities of the enterprise. According to a statement by the Minister of Education (October 1965), about 20 per cent of university engineer posts are occupied by graduates of HTS, and 30 per cent of upper-level technician posts are occupied by graduates of the technological universities. A considerable number of HTS engineers (nearly 40 per cent) are employed in the government offices (administration, public works, technical departments, education) or run their own businesses.

127. Lower-level technician courses, which started only 20 years ago, are apparently not yet able to cope with demand. It is therefore not possible at present to define with any accuracy the actual role of this category of technical personnel in industry. It is expected that they will be used mainly as assistants to the engineers.

(b) Technicians' Professional association

128. Upper-level technicians are organised under a professional association, the NIRIA (Nederland Instituut van Register-Ingenieurs en Afgestudeerden van hogere technische scholen = Netherlands Association of Register-Engineers and Graduates of Higher Technical Schools). The Association deals mainly with professional matters, its activity in the educational field being limited to representation on ad hoc or permanent committees concerned with technical education. According to the Constitutional Act, the main purpose of the Association is to promote the scientific and technical ability of its members, and contribute to the further development of engineering education. Social matters, such as conditions of work, salaries, etc. do not fall within the Association's scope. Members should hold a Technical College (HTS) diploma although there are some exemptions for non-graduate experienced persons, who were working in industry at upper technician level when the Association was founded (five years ago). At present, membership is about 15,000, i.e. approximately only one third of the upper-level technician force.

(c) An inquiry into the metal industry

129. A visit to a large firm (Hoogovens steelworks) near Beverwijk in the metal industry (production of steel) brought to light certain interesting points in the training and utilisation of technical personnel, which are summarised below.

130. The above firm is the only one of its kind in the Netherlands, with the exception of a smaller one at Utrecht, specialising in the production of special steels. Total employment, in early 1965, was 17,091 plus 515 employees from other firms working on installation and building projects. Of these 2,480 were clerical staff and 14,611 were technical manpower and unskilled workers distributed by skill categories as shown in Table 3 below.

131. At the upper technician level the firm employs mainly graduates of technical colleges (HTS). Their training is considered satisfactory but there is still a severe shortage in this field. At the lower-technician level, many posts are filled by skilled workers specially trained by the firm (see below), graduates of middle technical schools

Table 3

Distribution of labour force in the Hoogovens steel-works by skill categories

	Actual numbers	Percentages
1. Total technical staff	3,585	100
of which:		
(i) University engineers or equivalent.	173	5
(ii) Upper-level technicians	835	23
(iii) Lower-level technicians	2,577	72
2. Total skilled/unskilled labour.	11,026	100
of which:		
(i) Skilled and highly skilled.	6,396	58
(ii) Semi-skilled.	2,530	23
(iii) Unskilled	2,100	19

Ratios

Engineer/upper level technician	1/4.6
Upper-level technician/lower-level technician	1/3.1
Lower-level technician/skilled and semi-skilled worker.	1/3.5

(UTS) not being considered as having the "right attitude" - at least for this type of work (they dislike manual occupations). The skilled and highly-skilled labour is trained within the industry.

132. The training facilities of the firm provide places for approximately 500 trainees, 400 of which are trained for the needs of the firm and 100 for several other firms in the vicinity. Training comprises normal apprenticeship (both theory and practice), subsidised by the government in the same way as other apprenticeship training centres (para. 72), and special advanced courses (mainly evening) for the further specialisation and promotion of capable skilled workers to technician posts.

XV. Careers and status of technicians

(a) Earnings

133. It appears that there are no sufficient statistical data available on which to base accurate conclusions concerning the earnings of technicians. However, the data summarised in Tables 4, 5, and 6 are a good indication and lead to the following general observations:

(i) The average income of an engineer (HTS), in either private industry or the Civil Service, is rarely higher than 65 per cent of that of a university engineer. This percentage falls to around 50 per cent for employed qualified persons with long experience (age 50-60);

(ii) Salary scales for technical manpower in the Civil Service are competitive with those in industry;

(iii) The average income of graduates from the various types of secondary and post-secondary schools compare as follows:

total earnings of a secondary technical school (UTS) graduate amount to approximately 76 per cent of those of a Technical College (HTS) graduate; earnings of lower technical school (LTS) graduates are in the vicinity of 90 per cent of those of middle technical school (UTS) graduates; modern grammar school (HBS) graduates earn about 96 per cent of the earnings of the secondary school graduates; there is no substantial difference between the earnings of an advanced primary school (ULO) graduate and those of a lower technical school (LTS) graduate.

(b) Prospects for higher studies and promotion

134. Promotion in industry largely depends on the abilities of the individual. Promotion through further studies linked with progress from lower level technician to engineer (HTS) and from engineer to university engineer is possible although, at present, there are only weak links for horizontal and vertical movement between the several technical courses within the educational system. Lower level technicians, for instance, may be admitted to technical colleges (HTS); even students of the middle technical schools (UTS) may enrol in a preparatory year of the technical college course provided they have completed the second year of their studies and have obtained good marks in mathematics and physics (para.37). Graduates of the technical colleges (HTS) may take a technological university course after passing a special test; they are exempt from various subjects, depending on the branch they follow (para.45).

135. Graduates of the technical colleges (HTS) although recognised as engineers in industry may not yet have the title of "engineer". NIRIA in collaboration with KIVI (Koninkligk Instituut Van Ingenieurs - Royal Association of Engineers), the corresponding association of university-engineers has established the "Foundation Roll of Netherlands Professional Engineers", whose main objective is to register graduates of the technical colleges as professional engineers. Enrolment is granted after at least 5 years of "successful" industrial experience and upon submitting a thesis setting out the results of a project in the field of engineering, carried out by the candidate. Enrolment is recognised

by the English societies of engineers as being equivalent to the academic requirements for the associate membership of the engineering societies concerned. Those enrolled in the register of the Foundation bear the title of engineer (Ingenieur) abbreviated to the initials "Ing." after their names. They are distinguished from the university engineers who use the initials "Ir." (Ingenieur) before their names.

Table 4

Average gross income of HTS engineers and university engineers working as employees

(in guilders/month)(1)

	Years of experience (age)					
	25-30	30-35	35-40	40-45	45-50	50-60
HTS engineers	750	920	1,120	1,240	1,370	1,400
University engineers. . . .	1,220	1,420	1,840	2,180	2,550	2,800

(1) 3.58 guilders = 1 US dollar.

Source: Central Bureau of Statistics, Statistics of salaried employees, 1962.

Table 5

Salary scales for technical manpower in the civil service

(in guilders/month)(1)

Classification	Salary scales	Technical qualifications normally required
1. Draughtsmen	314 - 522	LTS certificate or equivalent.
	665 - 913	LTS certificate + experience or additional qualifications.
2. Junior supervisors	392 - 665	UTS certificate or equivalent.
	754-1,007	UTS certificate + experience or additional qualifications.
3. Senior supervisors	470 - 668	HTS diploma or equivalent.
	1,077-1,380	HTS diploma + experience or additional qualifications.
4. Engineers	754 - 913	University degree.
	1,795-2,303	University degree + experience.

(1) 3.58 guilders = 1 US dollar.

Source: Ministry of Civil Service, 1962.

Table 6

Average gross income of technical and general secondary school graduates

(in guilders/month)(1)

Years of experience (age)	Graduates of				
	* 1	II	III	IV	V
-20	163 163	163 -	- -	156	-
20 - 25	314 336	329 335	452 542	291	376
25 - 30	425 453	467 471	567 574	453	493
30 - 35	575 574	565 583	686 742	553	582
35 - 40	610 638	663 695	781 788	632	737
40 - 45	634 667	734 726	829 927	744	783
45 - 50	695 702	753 830	1,067 -	664	945
50 - 55	670 718	704 769	914 -	719	-
55 - 60	740 817	778 827	1,045 -	850	-
60+	709 816	694 850	841 -	-	722

* I. Lower technical schools (LTS) + additional certificates.

II. Intermediate technical schools (UTS) + additional certificates.

III. Higher technical schools (HTS) + additional certificates.

IV. Advanced primary schools (ULO).

V. Higher secondary schools.

(1) 3.58 guilders = 1 US dollar.

Source: Central Bureau of Statistics, 1962.

Part Four

GENERAL INFORMATION

STATISTICAL DATA

XVI. The financial situation

(a) National Income

136. Since 1952, the Dutch economy has been expanding constantly, with National Income rising at an average annual rate of about 6 per cent at current prices or 4.8 per cent at constant, 1958 prices. The annual net income of the Dutch people amounted to G.38,700 million in 1962; compared with 1952, National Income has more than doubled (Table 7). The standard of living, as compared with those in other European countries, is decidedly high (Table 8).

(b) Industry

137. Despite a lack of raw materials, the Netherlands have succeeded in developing modern industry, especially since the second world war. During the period 1952-62, the contribution of industry to the National Income increased by 4.3 per cent, while, during the same period, that of agriculture showed a decrease of 6.1 per cent (Table 9).
138. The most spectacular expansion has been in the metal industries, the index being 210 in 1962 as compared with 100 in 1953 (Table 10). In 1960, the Dutch metal industry accounted for 29 per cent of the country's total industrial output, and nearly 34 per cent of its total industrial exports. It includes the production of pig-iron and steel, steam and internal combustion engines, industrial machinery, shipbuilding and transport equipment.

139. The most important among the other industries are: the electrical engineering industry, which covers the whole range from tiny transistors to complete power stations; the chemical industry, which is based mainly on the processing of coke, oven and synthetic gas; the textile and clothing industry, which occupies about 18 per cent of the country's total industrial labour force, meets about 90 per cent of the domestic demands and accounts for 10 per cent of the industrial exports; the food and beverage industry, which is one of the oldest in the country and contributes considerably to the country's exports.

140. During the period 1953-62, 1,247 new industrial firms were established. Although, by the end of this period, only 1,013 were still in operation, the total number of persons initially employed increased by over 60 per cent (Table 11).

(c) Foreign trade

141. Trade competes with agriculture and industry as the most important source of prosperity in Holland. Goods needed in Germany, Switzerland, Central Europe and Eastern France are best imported via Rotterdam or Amsterdam located on the North Sea and at the mouth of Western Europe's largest rivers. This has made Holland a staple and transit market.

142. Even though the larger industrial firms produce mainly for export, imports, in terms of value, surpass exports. During the period 1958-62 the average value of exports amounted to 38.9 and that of imports to 43.9 per cent of the average GNP(1) at factor cost (Table 12). The percentage of imports covered by exports does not show any constant trend. In 1938, it was only 73.9 per cent, reaching 94.9 per cent by 1952 but dropping again to 85.7 per cent in 1962 (Table 13).

(d) Expenditure for education

143. Public expenditure for education amounted to over G.2,000 million in 1960, and to G.3,780 million in 1965. In 1960, sixty per cent of the total was spent in subsidising private schools and 34 per cent in subsidising State schools. At both secondary and higher levels, technical education has a fair share, namely 39.5 per cent and 27.0 per cent

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(1) GNP at factor cost in 1958, guilders 33,083 million; in 1962, guilders 43,210 million.

respectively of the total expenditure for the level of education concerned (Table 14). As a percentage of National Income, expenditure for education has showed a constant increase since 1952; in 1960, it amounted to 5.76 per cent (Table 15) or 4.7 per cent of GNP, and in 1965 rose to 5.7 per cent of the latter. It is expected that by 1975 public expenditure for education will rise to about G.7,000 million which will then correspond to approximately 7 per cent of GNP at market price.

Table 7

National Income (1952-1962)

Year	Mil.guilders	Index: 1958 = 100	
		Current prices	Constant prices
1952	17,689	63	75
1956	26,493	91	99
1958	29,560	100	100
1960	35,155	120	120
1962	38,700	123	123

Source: Statistical Year Book of the Netherlands, 1961/62, Central Bureau of Statistics.

Table 8

Living Standards

1. Calories per head per day, 1961-62	3,030
2. Average hourly earnings of workers in US dollars in industry, April 1962	245 cents
3. Number of private cars per 1,000 inhabitants, 1962	62
4. Number of telephones per 1,000 inhabitants, 1962	150
5. Number of radio sets per 1,000 inhabitants, 1963	211
6. Number of T.V. sets per 1,000 inhabitants, beginning 1963	106
7. Public expenditure on arts, sciences and post-school education (percentage of national income, 1959	6.51

Source: Economic Surveys by the OECD, Netherlands, 1964.

Table 9

Origin of national income, 1952 - 1962

(as a percentage of national income)

Origin	1952	1956	1960	1962
1. Domestic product (Net, factor cost of enterprises)	87.9	88.0	87.8	86.9
(i) Agriculture, forestry and fishing	15.3	10.9	10.8	9.2
(ii) Industry (mining, manufacturing, construction, electricity, gas, water).	37.8	41.2	42.4	42.1
(iii) Commerce, ownership of dwelling.	17.5	18.8	17.8	19.0
(iv) Transport, storage and communications.	8.2	8.1	7.7	7.3
(v) Other services.	9.1	9.0	9.1	9.3
2. Government.	10.3	10.9	11.1	12.1
3. Rest of the world	1.8	1.1	1.1	1.0
Domestic product (net factor cost, 1 + 2).	98.2	98.9	98.9	99.0
National income	100.0	100.0	100.0	100.0

Source: Statistical Yearbook of the Netherlands, 1961/62, Central Bureau of Statistics.

Table 10

Index numbers of industrial production (construction excluded)

1953 = 100

	1958	1960	1962
General index of production	127	157	160
1. Structural clay products and earthenware.	144	129	134
2. Leather and rubber industries.	122	144	151
3. Mining	110	120	120
4. Metal and allied industries.	138	199	210
5. Paper industry	129	158	160
6. Textile industries	112	133	139
7. Gas, electricity and water	141	165	191
8. Foodstuffs, beverages, tobacco	118	130	136

Source: Statistical Yearbook of the Netherlands, 1961/62,
Central Bureau of Statistics

Table 11

New industrial establishments (1953-1962)

Year	Member of new establishments	Still in operation (1962)	Persons employed	
			A(1)	B(1)
1953-1962	1,247	1,013	38,398	63,438
1957	136	102	3,667	6,346
1958	105	84	2,335	3,681
1959	129	114	2,998	5,002
1960	149	142	4,103	7,040
1961	148	134	5,219	7,056
1962	118	118	4,185	4,185

(1) A: End of the year in which the establishment was put into operation.
B: End of 1962

Source: Central Bureau of Statistics

Table 12

Foreign Trade and its relation to GNP

Imports	Exports
1. Imports as a percentage of the GNP (average 1958-62). 43.9	1. Exports as a percentage of the GNP (average 1958-62). 38.9
2. Main imports in 1963 (percentage of total imports):	2. Main exports in 1963 (percentage of total exports):
- Machinery and transport equipment 26	- Machinery and transport equipment. 21
- Food, drink and tobacco 14	- Petroleum products. . . 10
- Mineral fuels 12	- Textiles (including clothing. 10
- Textiles. 11	- Chemical products . . . 9
- Chemical products . . . 6	- Dairy products, eggs, honey 7

Source: (a) Statistical Year Book of the Netherlands 1961-62.
(b) Economic Surveys by the OECD, Netherlands 1964.

Table 13

Export and import trade, 1938-1962

(in million guilders)

Year	Imports	Exports	Balance (Imp.-Exp.)	Imports covered by exports %
1938	1,460	1,079	381	73.9
1952	8,449	8,015	434	94.9
1956	14,156	10,876	3,280	76.8
1960	17,217	15,305	1,912	88.9
1962	19,358	16,596	2,762	85.7

Source: Statistical Yearbook of the Netherlands, 1961/62,
Central Bureau of Statistics.

Table 14

Public expenditure by level and type of education (1960)

	Thousand guilders (1)	Percentage of total
1. Primary education (including nursery schools and primary teacher-training)	874,595	43.5%
2. Secondary education	788,960	39.4%
(i) Secondary modern schools (advanced primary).	186,753	23.5
(ii) Sec.grammar schools (gymnasia and HBS).	218,741	27.5
(iii) Technical and domestic science (including apprenticeship). . . .	312,138	39.5
(iv) Agricultural and horticultural schools	28.841	4.0
(v) Other schools and courses (sec. teacher-training, art schools, etc.)	42,487	5.5
3. Higher education	288,353	14.4%
(i) Universities.	168,259	58.5
(ii) Technological universities. . . .	78,421	27.0
(iii) Agricultural universities	12,939	4.5
(iv) Schools of economics.	3,774	1.5
(v) Other expenditure	24,960	8.5
4. Adult education	15,817	0.8%
(i) Adult vocational training	10,130	
(ii) **Youth institutes**.	5,687	
5. Other expenditure (inspection of schools, miscellaneous)	38,820	1.9%
Total.	2,006,545	100%
of which: For public schools	676,225	
For private schools.	1,213,482	

(1) 3.58 guilders = 1 US dollar

Source: Central Bureau of Statistics

Table 15

Public expenditure for education as a percentage of the national income and per capita

(1952-1960)

	1952	1954	1956	1958	1960
1. At current prices					
(i) Total expenditure (in mil.guilders)	683.5	934.4	1,312.5	1,609.5	2,006.4
(ii) Per cent of national income .	3.85	4.33	4.96	5.45	5.76
(iii) Per capita (in guilders) . .	65.84	88.02	120.53	143.87	174.67
2. At constant prices of 1958					
(i) Total expenditure (in mil.guilders)	813.7	1,085.3	1,422.0	1,609.5	1,951.8
(ii) Per capita (in guilders) . .	78.38	102.24	130.59	143.87	169.92

Source: Central Bureau of Statistics: Statistical Year Book of the Netherlands, 1961/62.

XVII. Educational statistics

144. Trends in education and the situation as of 1962 are shown in Tables 16 to 24.

In 1962, 46.5 per cent of the total enrolment in secondary education was at technical and vocational secondary schools (Table 16). The percentage of the population attending school increased considerably during the period 1953-61, particularly for the age groups 12 to 21 (Table 17).

145. In 1962, participation in secondary education reached nearly 86 per cent of the total primary school leaving population with a balanced distribution between the several courses (Table 18). In 1945, enrolment in secondary general schools exceeded that in secondary technical and vocational schools by 5.6 per cent. This ratio was reversed in 1950, and nearly doubled in favour of technical education. However, in 1962, it again fell to 4.6 per cent (Table 19).

146. The number of graduates of the various secondary courses showed a constant increase in absolute numbers during the period 1958-62, with the exception of the agricultural courses (Table 20). A slight fall in the higher technician courses is only incidental. Enrolment and output of technical courses, by level and branch of specialisation, are summarised in Tables 21 to 23.

147. Despite the scarcity of upper-level technicians in certain fields, the rate of expansion of the respective courses appears rather slow (Table 21); for lower-level technician courses, although this rate is considerably higher (Table 22), there is still much to be done to satisfy the needs of industry.

148. In 1961, the output of the technical courses at university level was about 51 per cent of that of the upper-level technician courses (Table 23). Enrolment in university technical courses as a percentage of total university enrolment increased by 1.1 per cent during the period 1945-61 (Table 24).

Table 16

Summary of basic data on education, 1962

Branch of education	Schools	Teachers	Number of pupils ('00)	Percentages	
1. Primary level	-	-	1,915.4	63.2	-
(i) Nursery schools	4,748	12,336	423.1		
(ii) Ordinary primary.	7,745	42,013	1,395.0		
(iii) Complementary primary schools and courses	431	1,669	39.6		
(iv) Special schools	610	4,215	57.7		
2. Secondary level			1,068.5	35.2	100.0
(i) Secondary modern schools (advanced primary)	1,235	10,092	276.3	-	25.8
(ii) Secondary grammar schools (gymnasia and HBS). . . .	457	12,720	185.8	-	17.4
(iii) Part-time secondary general schools	172	-	25.5	-	2.4
(iv) Teacher-training nursery (1961)	51	808	6.3	-	0.6
(v) Teacher-training-primary.	94	-	24.6	-	2.6
(vi) Technical and home economics education (including apprenticeship)	1,471	-	498.6	-	46.6
(vii) Agricultural and horticultural schools.	430	-	27.4	-	2.6
(viii) Agricultural and horticultural courses (1961) . . .	1,235	-	20.2	-	1.9
(ix) Social workers' and youth leaders' training schools	20	-	3.8	-	0.4
3. Higher level					
Universities and higher schools	11	-	47.4	1.6	
Total.	-	-	3,031.3	100.0	

Source: Statistical Yearbook of the Netherlands, 1961/62, Central Bureau of Statistics.

Table 17

Pupils by age, and course attended, as percentage of the population of the age concerned (1953-1961)

Type of education	Age group						
	33-55	6	7-11	12-14	15-17	18-20	21+
1. Full-time (total)							
1953 . . .	45.1	94.3	99.4	89.2	33.5	10.6	2.4
1961 . . .	52.4	97.9	99.8	93.8	48.6	16.0	3.4
(i) Nursery							
1953 . . .	45.1	23.4	-	-	-	-	-
1961 . . .	52.4	23.5	-	-	-	-	-
(ii) Primary							
1953 . . .	-	70.9	99.3	37.8	0.8	-	-
1961 . . .	-	74.5	99.7	26.3	0.7	-	-
(iii) Sec.general							
1953 . . .	-	-	0.1	33.9	18.1	2.7	
1961 . . .	-	-	0.1	42.5	26.7	3.5	
(iv) Sec.technical and vocational							
1953 . . .	-	-	-	17.5	14.5	6.9	0.9
1961 . . .	-	-	-	25.0	21.1	10.4	1.3
(v) University							
1953 . . .	-	-	-	-	0.1	1.0	1.5
1961 . . .	-	-	-	-	0.2	2.1	2.1
2. Part-time (total)							
1953 . . .	-	-	-	2.3	12.5	8.8	4.1
1961 . . .	-	-	-	0.8	7.9	9.0	5.7
(i) Sec.general							
1953 . . .	-	-	-	2.1	10.5	7.6	3.9
1961 . . .	-	-	-	0.8	7.8	8.8	5.5
(ii) Other							
1953 . . .	-	-	-	0.2	2.0	1.2	0.2
1961 . . .	-	-	-	-	0.1	0.2	0.2
Total (1+2) 1953 . . .	45.1	94.3	99.4	91.5	46.0	19.4	6.5
1961 . . .	52.4	97.9	99.8	94.6	56.5	25.0	9.1

Source: Statistical Yearbook of the Netherlands, 1961/62, Central Bureau of Statistics.

Table 18

Participation in secondary education (1962)

	Actual figures	Percent- ages
1. Total leavers (primary schools)	231,827	
(i) from grades 1-5	9,483	-
(ii) " " 6-8	194,885	
(iii) Continuation schools and classes	27,459	
2. Admitted to secondary schools	198,774	100.0
(i) Secondary modern schools (advanced primary)	72,570	36.5
(ii) Secondary grammar schools (Gymnasia and HBS)	33,742	17.0
(iii) Secondary technical and vocational schools (including apprenticeship)	87,611	44.0
(iv) Agricultural and horticultural schools	4,851	2.5

Source: Statistical Yearbook of the Netherlands, 1961/63,
Central Bureau of Statistics

Table 19

Trends in secondary education (1945-1962)

Year	Total numbers ('000)	Number of students enrolled by type of education			
		General (1)		Technical & vocational (2)	
		Pupils ('000)	% of total	Pupils ('000)	% of total
1945.	365.0	192.6	52.8	172.4	47.2
1950	518.1	236.0	45.5	282.1	54.5
1955	663.7	316.9	47.7	346.8	52.3
1957	772.9	372.9	48.2	400.0	51.8
1962	1,051.7	501.7	47.7	550.0	52.3

(1) Including complementary and advanced primary schools.

(2) Including home economics, agricultural and commercial schools.

Source: (a) World Survey of Education III, Secondary Education, Netherlands (UNESCO).(b) Central Bureau of Statistics.

Table 20

Secondary school leaving certificates by type of education (1958-1962)

Type of school	1958	1960	1962
1. Secondary modern (Advanced primary) . . .	26,145	31,042	36,933
2. Secondary grammar (Gymnasium and HBS) . .	–	14,066	16,424
3. Lower technical schools			
Full-time	22,357	25,317	28,957
Part-time	3,737	5,648	8,216
4. Middle technical and vocational schools .	1,138	1,288	1,927
5. Apprenticeship scheme	11,851	13,335	16,245
6. Technical colleges.	1,945	1,901	1,871
7. Technical-teacher training courses. . . .	397	454	574
8. Domestic science schools			
Junior courses	33,075	41,648	48,737
Senior courses	4,750	5,725	6,353
9. Agricultural and horticultural schools. .	7,891	8,405	7,130
10. Commercial schools			
Day	–	392	445
Evening	3,725	3,760	3,970

Source: Statistical Yearbook of the Netherlands, 1961/62,
Central Bureau of Statistics.

Table 21

Upper-level technician courses - enrolments and output

(1950-1961)

Branch	Number of students			Number of graduates		
	1950	1956	1961	1950	1956	1961
1. Architecture	1,255	1,192	1,364	212	234	274
2. Civil engineering. . . .	1,085	1,460	1,723	264	296	358
3. Mechanical engineering .	3,545	2,982	3,020	540	706	650
4. Mechanical technology. .	-	491	343	-	108	87
5. Electrical engineering .	1,053	1,397	2,077	265	320	321
6. Naval architecture . . .	120	140	153	36	22	23
7. Aircraft engineering . .	69	80	89	21	19	33
8. Chemical engineering . .	350	505	520	66	119	119
9. Chemistry.	-	81	92	-	18	18
10. Physics engineering . .	59	44	89	7	22	7
11. Industrial engineering.	16	47	44	2	22	26
12. Geodesy	-	97	109	-	-	29
13. Textile-machine engineering.	-	12	41	-	-	3
14. Motor engineering. . .	-	114	97	-	23	21
15. Preparatory classes. .	(1)	446	384	-	-	-
Total	7,552	9,298	10,299	1,413	1,949	1,960

(1) Unknown

Source: Report on the education and training of engineers of non-university level and technicians in the Netherlands (1963).

Table 22

Lower-level technician courses (middle technical schools)
Enrolments and output (1950-1961)

Branch	Number of students			Number of graduates		
	1950	1956	1961	1950	1956	1961
1. Architecture	113	412	1,496	30	49	206
2. Civil engineering.	-	45	346	-	-	44
3. Mechanical engineering . .	128	1,161	2,790	20	95	509
4. Electrical engineering . .	390	934	2,199	72	111	329
5. Auto-mechanics	231	96	17	25	60	70
6. Instrument construction. .	185	283	76	44	-	21
Preparatory classes. . . .	(1)	918	2,072			
Total.	1,047	3,849	8,996	191	315	1,179

(1) Unknown

Source: Report on the education and training of engineers of non-university level and technicians in the Netherlands (1963).

Table 23

Technical courses at university level - enrolments and output

(1961-62)

Branch	Enrolments	Graduates (1961)
1. Civil engineering	1,242	85
2. Architecture.	748	10
3. Mechanical engineering.	1,790	119
4. Naval engineering	150	10
5. Aircraft engineering.	331	21
6. Electrical engineering.	1,419	96
7. Chemical engineering.	1,282	94
8. Mining engineering.	218	25
9. Physics engineering	936	58
10. Geodetical engineering.	115	21
11. Metallurgy.	77	8
12. Mathematical engineering.	148	11
13. No special branch	106	-
Total	8,562	558

Source: Statistical Yearbook of the Netherlands, 1961/62,
Central Bureau of Statistics.

Table 24

University courses, enrolments and output (1945-1961)

Faculty	Number of students			Number of graduates
	1945/46	1958/59	1961/62	1961
1. Technical sciences	4,027	6,617	8,562	558
2. Agricultural sciences. . . .	1,136	917	1,209	83
3. Natural sciences (including mathematics)	2,306	5,256	6,484	340
4. Medical sciences	5,849	5,966	7,653	604
5. Other.	8,473	16,134	20,029	1,254
Total.	21,791	34,890	43,937	2,839

Source: (a) Ministry of Education, Arts and Sciences, Dutch School System, 1960.

(b) Statistical Yearbook of the Netherlands, 1961-1962.

XVIII. Population and manpower statistics

(a) The land and the people

149. Holland is the most densely populated country in the world, with 354 inhabitants per sq.Km. (1963) and a land area of 33,600 sq.Km. More than 40 per cent of the population live in the three western largest cities - Amsterdam, Rotterdam and the Hague. The population increased by 57 per cent during the period 1930 - 1960 (Table 25) with an average annual rate of 13.4 per thousand inhabitants during the period 1956-62. In order to alleviate over population, the government encourages emigration to other parts of the world. During the period 1946-60, 350,000 Dutch people left their country for good.

150. Holland is a constitutional monarchy with the executive power in the hands of a "cabinet", which requires the support of the parliamentary majority. The Dutch constitution guarantees complete religious freedom; although religion plays an integral part in Dutch life, differences in belief do not affect the unity of the nation. According to the last census, 44 per cent of the population are Protestant, 38.5 per cent Roman Catholic, 0.15 per cent belong to other faiths and 17 per cent are not denominational.

(b) Active population

151. Active population in the year 1960 was 4,168,626, i.e. approximately 36 per cent of the whole population, occupied as in Table 26. During the period 1947-60 manpower from low productivity sectors was transferred to sectors with a higher productivity, particularly in manufacturing. In 1960 the secondary sector (1) occupied 42.2 per cent of the active population as against 35.4 per cent in 1947 (Table 26). During the same period (1947-60) female participation in the labour force dropped from approximately 24.6 per cent to 22.2 per cent of the total active population. Foreign labour force dropped from 38,000 in 1957 to 32,049 in 1962 which is less than 1 per cent of the active

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(1) Mining, manufacturing, construction, electricity, gas and water.

population (Table 28). Unemployment, already negligible in 1959, dropped further, to slightly over 0.5 per cent of the total active force, in 1962 (Table 29).

(c) Highly qualified manpower

152. Distribution of university engineers and HTS engineers by field of specialisation is given in Tables 30 and 31 respectively. In 1930 the University-engineer-force surpassed by some 54 per cent the HTS engineers but during the period 1930-60 the latter increased at a much higher rate so that by the end of this period the ratio university-engineer/HTS engineer reached 1:3.1 (Table 32).

153. It appears that there are no sufficient data available on which one could base accurate forecasts for future employment, but further investigation in this field is now being carried out. According to information supplied by the Central Planning Bureau (Table 33) an overall shortage of 2,400 university engineers is envisaged for 1975; the total engineer-force should count by then 25,300 as against 22,950 which the educational system with its normal expansion can supply.

154. During the same period a slight overall shortage (1,100) of HTS engineers is also envisaged. According to investigations carried out by a committee specially appointed for this purpose, there will be a severe shortage in the fields of electrical, chemical and physics engineering, but in several other branches, including civil engineering, a considerable surplus is envisaged (Table 34).

155. The total number of HTS engineers required in 1975 is estimated at 70,600 as against 69,500 which the educational system can supply according to its present capacity and normal expansion. The overall university engineer/HTS engineer ratio will be maintained practically constant (1:3.1).

Table 25

Total population (1930-1962)

Year	Population
1930	7,935,565
1940	8,923,245
1950	10,200,280
1960	11,556,008
1961	11,721,416
1962	11,889,962
1963	12,042,000 (estimated)

Source: Statistical Yearbook of the Netherlands, 1961-62, Central Bureau of Statistics.

Table 26

Economically active population by division of economic activity

(1947 - 1960)

Field	Actual number		Percentages	
	1947	1960	1947	1960
1. Agriculture (including forestry, hunting and fishing)	727,698	446,695	18.8	10.7
2. Mining and quarrying	52,084	60,696	1.4	1.5
3. Manufacturing	978,497	1,245,784	25.3	29.9
(i) Food, beverages, tobacco	-	193,544		
(ii) Textiles	-	106,820		
(iii) Footwear, clothing	-	125,887		
(iv) Furniture, wood products	-	70,901		
(v) Paper and paper products	-	29,809		
(vi) Printed matter	-	63,886		
(vii) Leather and rubber products	-	23,453		
(viii) Chemicals	-	67,528		
(ix) Petroleum and coal products	-	15,696		
(x) Clay, glass, earthenware porcelain	-	54,338		
(xi) Metal industries (including machinery)	-	226,955		
(xii) Electric machinery and apparatus	-	93,443		
(xiii) Transport equipment	-	143,362		
(xiv) Miscellaneous	-	30,162		
4. Construction and allied industry	295,883	404,365	7.7	9.7
5. Electricity, gas, water, sanitary services	38,968	46,905	1.0	1.1
6. Commerce, banking and insurance	534,896	675,899	13.8	16.2
7. Transport, storage and communication	243,512	288,940	6.3	6.9
8. Services (1)	619,343	786,655	16.0	18.9
of which: education	-	140,663		
9. Miscellaneous	375,564	212,687	9.7	5.1
Total	3,866,445	4,168,626	100.0	100.0
of which: male	2,922,842	3,240,511		
female	943,603	928,115		

(1) Excluding domestic services and armed forces on compulsory military service.

Source: Statistical Yearbook of the Netherlands, 1961/62, Central Bureau of Statistics.

Table 27

Economically active population by level of education

(May,1960)

Level of education	Actual numbers (x 100)			In percentages		
	Male	Female	Total	Male	Female	Total
1. Primary	1,838	502	2,340	56.7	54.1	56.1
2. Lower secondary (Adv.primary)	1,054	340	1,394	32.6	36.6	33.5
3. Secondary	220	76	296	6.8	8.3	7.1
4. Post-secondary. . . .	76	5	81	2.3	0.5	1.9
5. University.	52	5	57	1.6	0.5	1.4
Total	3,240	928	4,168	100.0	100.0	100.0

Source: Statistical Yearbook of the Netherlands, 1961-62
Central Bureau of Statistics.

Table 28

Foreign labour-force

(Number of current working permits for foreign workers,Nov.30, 1962)

Year	Male	Female	Total
1957	28,584	9,476	38,060
1958	22,718	7,138	29,856
1960	25,206	8,751	33,957
1962	26,704	5,345	32,049

Source: Statistical Yearbook of the Netherlands, 1961-1962, Central Bureau of Statistics.

Table 29

Unemployment

(Unemployed registered at the labour exchange)

(monthly averages)

Year	Total	Industrial
1959	63,030	16,302
1960	41,279	8,269
1961	31,328	5,397
1962	30,278	4,757

Excluding workers on complementary work and including workers temporarily stopped.

Source: Statistical Yearbook of the Netherlands, 1961-1962, Central Bureau of Statistics.

Table 30

Distribution of university engineers by specialisation

(1930 - 1960)

Field	1930	1947	1955	1960
1. Civil engineering	-	-	1,850	2,150
2. Mechanical engineering.	-	-	2,175	2,550
3. Electrical engineering.	-	-	1,500	1,850
4. Chemical engineering.	-	-	1,350	1,600
5. Physical engineering.	-	-	360	600
6. Other	-	-	1,035	1,200
Total	4,530	6,570	8,270	9,950

Source: Central Planning Bureau

Table 31

Distribution of HTS engineers by specialisation

(1930 - 1960)

Field	1930	1945	1950	1955	1960
1. Civil engineering and architecture	950	4,300	6,050	8,200	10,500
2. Mechanical engineering . .	1,200	4,250	6,150	8,750	11,950
3. Electrical engineering . .	550	2,200	3,150	4,300	5,700
4. Chemical engineering . . .	200	850	1,050	1,350	1,750
5. Physical engineering . . .	-	-	50	100	200
6. Other.	50	350	600	850	1,200
Total.	2,950	11,950	17,050	23,550	31,300

Source: Preliminary report on the demand and supply of HTS engineers, February 1962, (by a special committee)

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Table 32

Distribution of university engineers and HTS engineers by specialisation - ratios (1960)

Field	Actual numbers		Ratio
	Univ. engineers	HTS engineers	Univ.engineers / HTS engineers
1. Civil engineering.	2,150	5,200	1 : 24.4
2. Architecture	450	5,300	1 : 11.8
3. Mechanical engineering . .	2,550	11,950	1 : 47.7
4. Electrical engineering . .	1,850	5,700	1 : 3.1
5. Chemical engineering . . .	1,600	1,750	1 : 1.1
6. Physical engineering . . .	600	200	1 : 0.3
7. Other.	750	1,200	1 : 1.4
Total.	9,950	31,300	1 : 3.1

Source: Preliminary report on the demand and supply of HTS engineers (higher technicians, February 1962, (by a special committee).

Table 33

Balance of supply and demand for university engineers
(1960-1975)

Field		1960 -65	1960 -70	1960 -75	Surplus (+) or deficit (-)	Total force 1975
1. Civil engineering						
	Supply . . .	345	945	1,780	-985	3,930
	Demand . . .	1,065	1,865	2,765		4,915
2. Mechanical engin.						
	Supply . . .	625	1,625	3,015	-605	5,565
	Demand . . .	1,220	2,320	3,260		6,170
3. Electrical engin.						
	Supply . . .	475	1,270	2,375	-875	4,225
	Demand . . .	1,050	2,050	3,250		5,100
4. Chemical engin.						
	Supply . . .	435	1,080	1,980	-390	3,580
	Demand . . .	770	1,470	2,370		3,970
5. Physical engin.						
	Supply . . .	275	720	1,340	-270	1,940
	Demand . . .	510	1,010	1,610		2,210
6. Other						
	Supply . . .	540	1,355	2,510	+725	3,710
	Demand . . .	485	1,085	1,785		2,935
Total	Supply . . .	2,695	6,995	13,000	-2,400	22,950
	Demand . . .	5,100	9,800	15,040		25,300

Source: Central Planning Bureau

Table 34

Balance of supply and demand for HTS engineers
(1960-1975)

Field	1960 -65	1960 -70	1960 -75	Surplus (+) or deficit (-)	Total force 1975
1. Civil engineering					
Supply . . .	1,700	3,800	5,950	+1,600	11,150
Demand . . .	1,150	2,550	4,350		9,550
2. Architecture					
Supply . . .	1,550	3,450	5,400	-350	10,700
Demand . . .	1,550	3,300	5,750		11,050
3. Mechanical engin.					
Supply . . .	4,050	8,950	13,950	+200	25,900
Demand . . .	3,800	8,000	13,750		25,700
4. Electrical engin.					
Supply . . .	2,000	4,450	6,950	-1,100	12,650
Demand . . .	2,150	4,800	8,050		13,750
5. Chemical engin.					
Supply . . .	750	1,650	2,600	-2,050	4,350
Demand . . .	1,050	2,500	4,650		6,400
6. Physical engin.					
Supply . . .	100	250	400	-1,200	600
Demand . . .	250	800	1,600		1,800
7. Other					
Supply . . .	850	1,900	2,950	+1,800	4,150
Demand . . .	350	700	1,150		2,350
Total: Supply . . .	11,000	24,450	38,200	-1,100	69,500
Demand . . .	10,300	22,650	39,300		70,600

Source: Preliminary report on the demand and supply of HTS engineers (higher technicians), February 1962, (by a special committee)

Appendix I

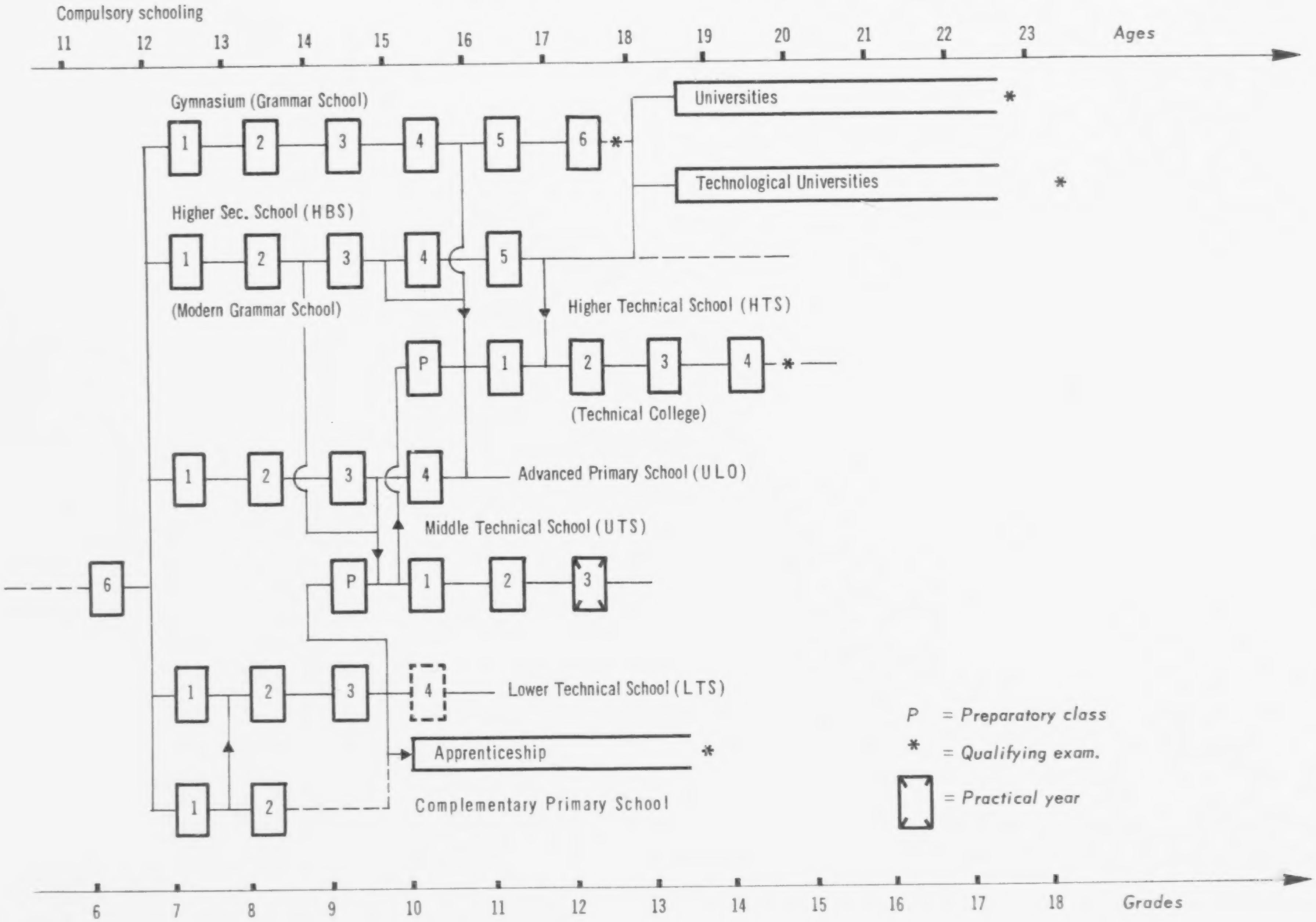
THE EDUCATIONAL STRUCTURE

A. Present Educational Structure

B. Planned Educational Structure

C. Principal Schools and Courses

A. "PRESENT" STRUCTURE OF TECHNICAL EDUCATION


Compulsory schooling
Ages
11
12
13
14
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16
17
18
19
20
21
22
23
Gymnasium (Grammar School)
Higher Sec. School (HBS)
(Modern Grammar School)
Universities
Technological Universities
Higher Technical School (HTS)
(Technical College)
Advanced Primary School (ULO)
Middle Technical School (UTS)
Lower Technical School (LTS)
Apprenticeship
Complementary Primary School
P
1
2
3
4
5
6
*
P = Preparatory class
* = Qualifying exam.
= Practical year
Grades
6
7
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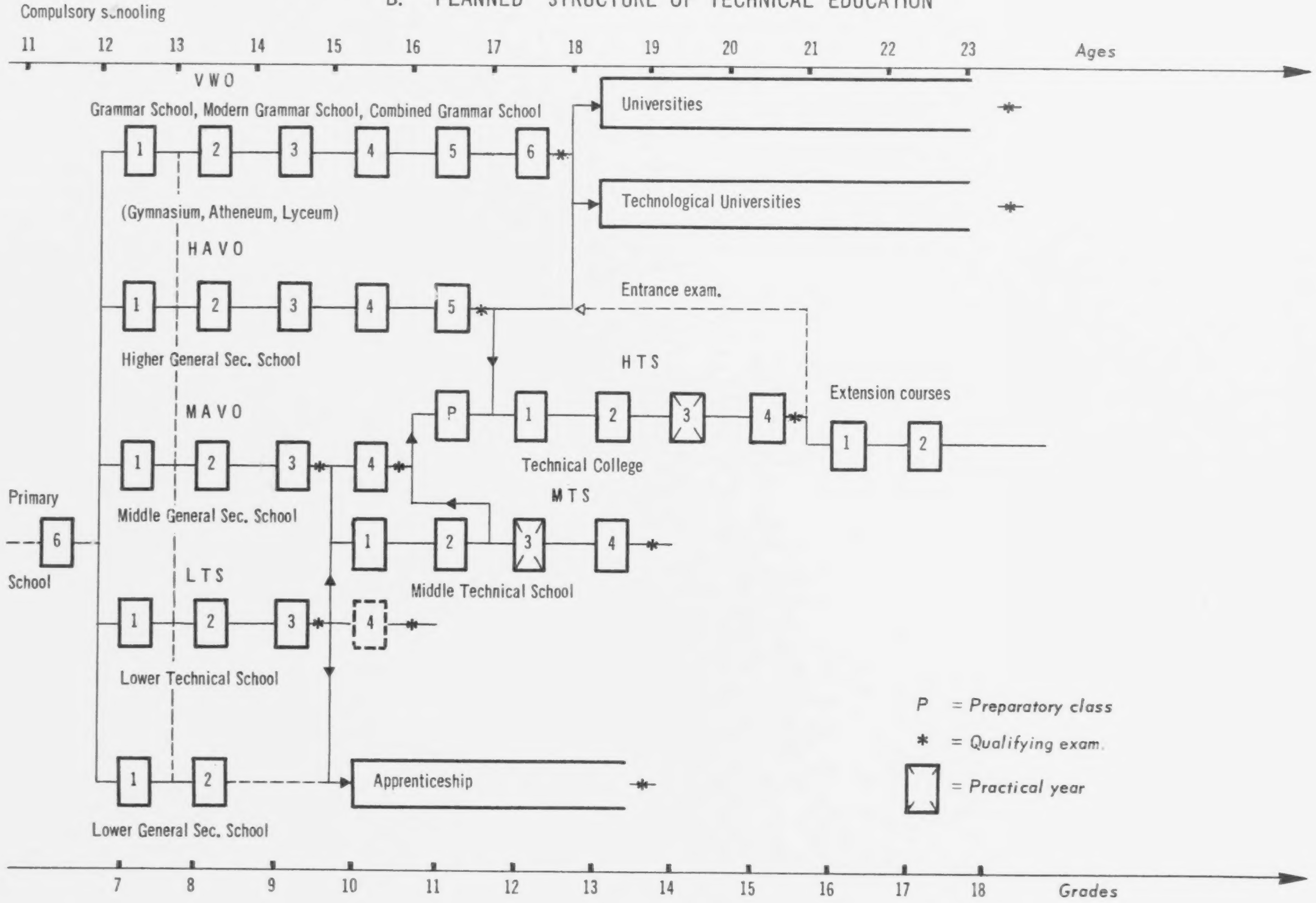
18

B. "PLANNED" STRUCTURE OF TECHNICAL EDUCATION


Compulsory s.nooling
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22
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Ages
V W O
Grammar School, Modern Grammar School, Combined Grammar School
(Gymnasium, Atheneum, Lyceum)
Universities
Technological Universities
H A V O
Higher General Sec. School
Entrance exam.
H T S
Extension courses
M A V O
P
Technical College
M T S
Middle General Sec. School
Primary
School
L T S
Middle Technical School
Lower Technical School
Apprenticeship
Lower General Sec. School
P = Preparatory class
* = Qualifying exam.
= Practical year
7
8
9
10
11
12
13
14
15
16
17
18
Grades

C. PRINCIPAL SCHOOLS AND COURSES

I. Primary level

1. Infant education

Infant education is not compulsory. It covers ages four to six and has been regulated by a special act since 1956.

2. Primary education - compulsory period

Primary education is regulated by the 1920 Act and is under the jurisdiction of the municipal authorities. It may be divided into:

(a) Ordinary primary education (Gewoon Lager Onderwijs) provided by the primary schools and starting at the age of six. It offers a general education in the form of six-year courses which cover the first stage of the eight-year compulsory schooling period.

(b) Complementary primary education (Voortgezet Gewoon Lager Onderwijs) provided by the complementary primary schools for the last two years of the compulsory schooling. It is intended for children who start work immediately after finishing their compulsory schooling and therefore pays special attention to social subjects and to developing vocational skill. The new Act provides for the establishment of two-year lower secondary schools, running parallel to the existing complementary primary schools. (4(a) below).

II. Secondary and post-secondary levels

Several types of schools and courses provide for general and vocational education at various levels between primary school and the university. Courses below university level but requiring a higher secondary school certificate (4 below) for admission may be classified as post-secondary (5 below). Secondary education is regulated by the new Act (1963), and may be divided into three broad categories namely: preparatory scientific, general and vocational.

3. Preparatory scientific education (VWO = Voorbereidend Wetenschappelijk Onderwijs) leads to university studies and under the new Act, is provided by:

(a) The Gymnasium which is comparable to the conventional grammar school. It has a six-year course divided after the fourth grade into A and B streams with emphasis on either Greek and Latin or sciences and mathematics respectively.

(b) The Atheneum which is a new type of six-year school, designed to replace the present higher secondary school (HBS = Hogere Burger School). Students are divided after the fourth grade into A and B streams with emphasis on either general subjects or science and mathematics respectively. The Atheneum is comparable to a modern grammar school.

(c) The Lyceum which is a combination of "gymnasium" and "atheneum" (combined grammar school) in the sense that after a common "substructure" of two years students may follow either a "gymnasium" or an "atheneum" course.

The leaving certificates of the above types of secondary schools give the right to sit for examinations in certain branches of higher education, depending on the line followed. The new Act states, however, that: "it is the Minister's intention to encourage a change in this system by allowing holders of the leaving certificate in any branch of preparatory scientific education to take examinations in any faculty or department of the university or technological universities.

4. General secondary education is provided at three levels, namely: lower, intermediate or middle, and higher:

(a) Lower general secondary education (LAVO = Lager Algemeen Voortgezet Onderwijs) - is at present provided by the complementary primary schools (see 1(b) above) but the new Act provides for a new type of two-year school, the lower secondary school (LAVO school) and the introduction of general education into the lower vocational school curriculum.

(b) Intermediate or middle general secondary education (MAVO = Middelbaar Algemeen Voortgezet Onderwijs) - occupies an important position in the educational system as it absorbs a

considerable percentage of the corresponding age group. It is now given by the so-called advanced primary schools (ULO = Uitgelreid Lager Onderwijs, schools) under a four-year programme. The new Act provides for a structural reform of the curriculum of the above schools which are expected to be the main source of recruitment for middle-level vocational training (see 5 below) and teacher-training courses.
The new middle general secondary school holds, at present, three- and four-year courses but whether both types of courses will continue to co-exist in the future has not yet been decided. The curriculum is general, although a certain amount of streaming is introduced in the 3rd or 4th grade.

(c) Higher general secondary education (HAVO = Hoger Algemeen Voortgezet Onderwijs) is entrusted to the Higher (General) Secondary School (HAVO school) which in fact represents a new type of five-year school designed to replace the present HBS school (Hogere Burger School = Higher Secondary School = modern grammar school). According to the Act this new type of school is expected to give an all-round education to prepare students for positions requiring highly educated persons but for which a university education is not necessary. This type of education does not prepare the student for a specific profession but provides a general training, which may serve as a basis for higher vocational training. The present girls' high school is to be regarded as a school for higher general secondary education for girls.

5. Technical and vocational secondary and post-secondary education

(for details see text under appropriate headings.)

In the same way as for general secondary education, technical and vocational education courses are provided at three levels (lower, intermediate and higher), and may be regarded as a continuation of the corresponding general secondary course which is normally a prerequisite for admission to technical or vocational courses (see diagram). Higher technical and vocational courses are preceded by the higher secondary general courses and may therefore be classified as post-secondary.

The duration of technical and vocational courses varies according to the level and type of course, but as a general rule lower-level courses last two or three years, intermediate courses three to four years, and higher courses four or five years. There are several types of technical and vocational schools providing for:

(a) Technical education at lower, intermediate and higher (post-secondary) levels, given by lower technical schools (LTS = Lagere Technische School), middle technical schools (MTS = Middelbaar Technische School) or (UTS = Uitgebried Technische School) and technical colleges or higher technical schools (HTS = Hogere Technische School) respectively.

(b) Home-economics and rural home economics for house and farm keeping.

(c) Agricultural education.

(d) Education for the trade, mainly crafts and retail trade.

(e) Economic and administrative education for commerce, industry transport, banking and the civil service.

(f) Socio-pedagogic education for work in the field of youth and adult education, social work and public health.

(g) Artistic education, covering the fields of art, music, etc.

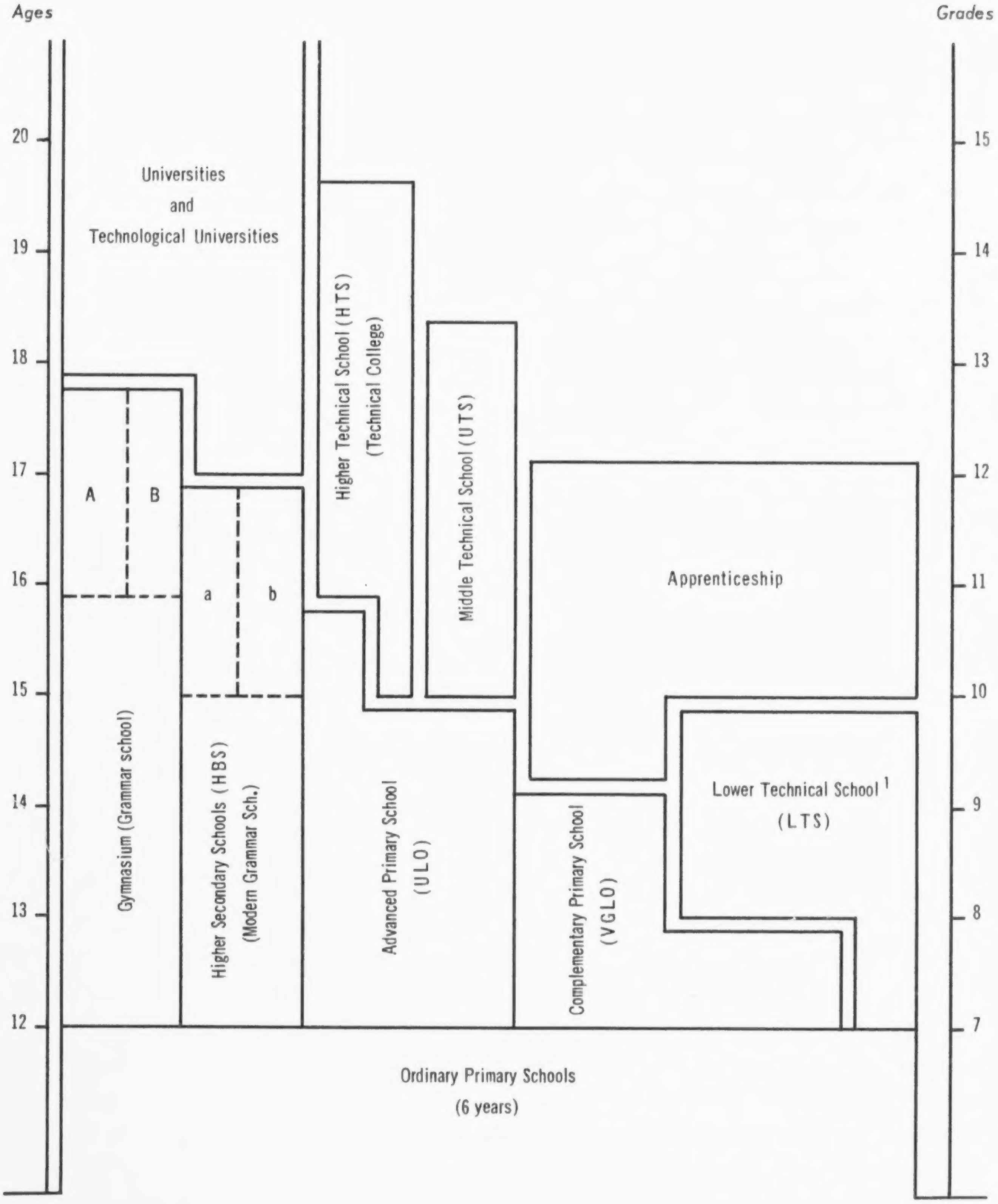
(h) Teacher-training for teachers of infant schools, primary schools, technical schools and lower-secondary schools.

III. Higher level

Higher education comprises the universities and the "high schools" of university standard. There exist at present six universities and six "high schools", namely, three "technological universities", one for agricultural sciences, and two for economics.

A preparatory scientific education certificate is required for admission to universities and high schools. For the technological university this certificate must be of "B" type (sciences and mathematics). Under certain conditions graduates of technical colleges may also be admitted (para. 45). The period of study varies from a minimum of four years (law) to a maximum of seven or eight years (medicine). For the technological faculties five years should be the normal length, although most of the students need at least seven years to prepare for their final examinations.

A. PRESENT EDUCATIONAL STRUCTURE


Ages
Grades
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7
Universities
and
Technological Universities
A
B
a
b
Gymnasium (Grammar school)
Higher Secondary Schools (H B S)
(Modern Grammar Sch.)
Higher Technical School (H T S)
(Technical College)
Middle Technical School (U T S)
Apprenticeship
Advanced Primary School
(U L O)
Complementary Primary School
(V G L O)
Lower Technical School 1
(L T S)
Ordinary Primary Schools
(6 years)

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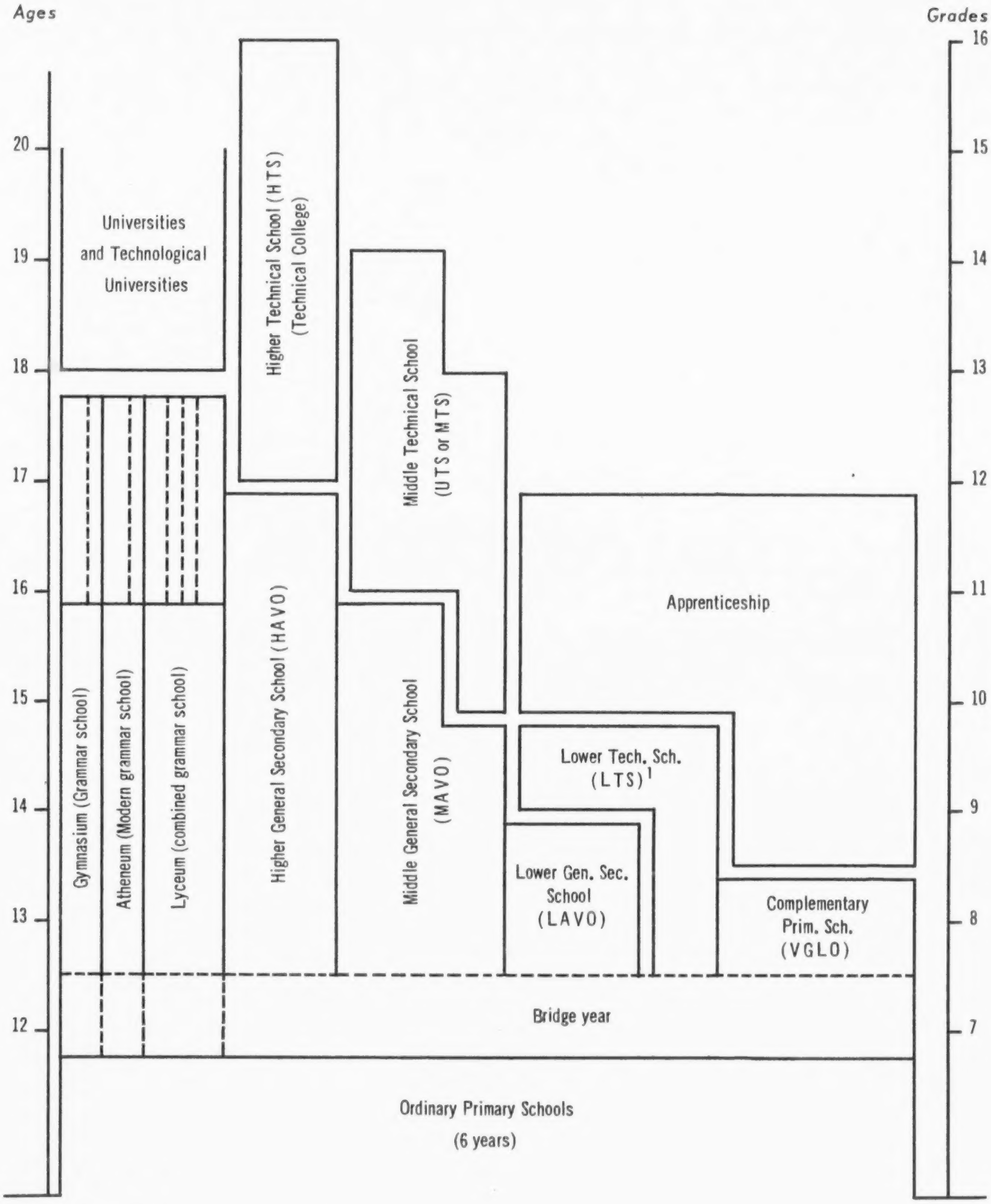
1. Certain Courses last 4 years at this level.

B. PLANNED EDUCATIONAL STRUCTURE


Ages
Grades
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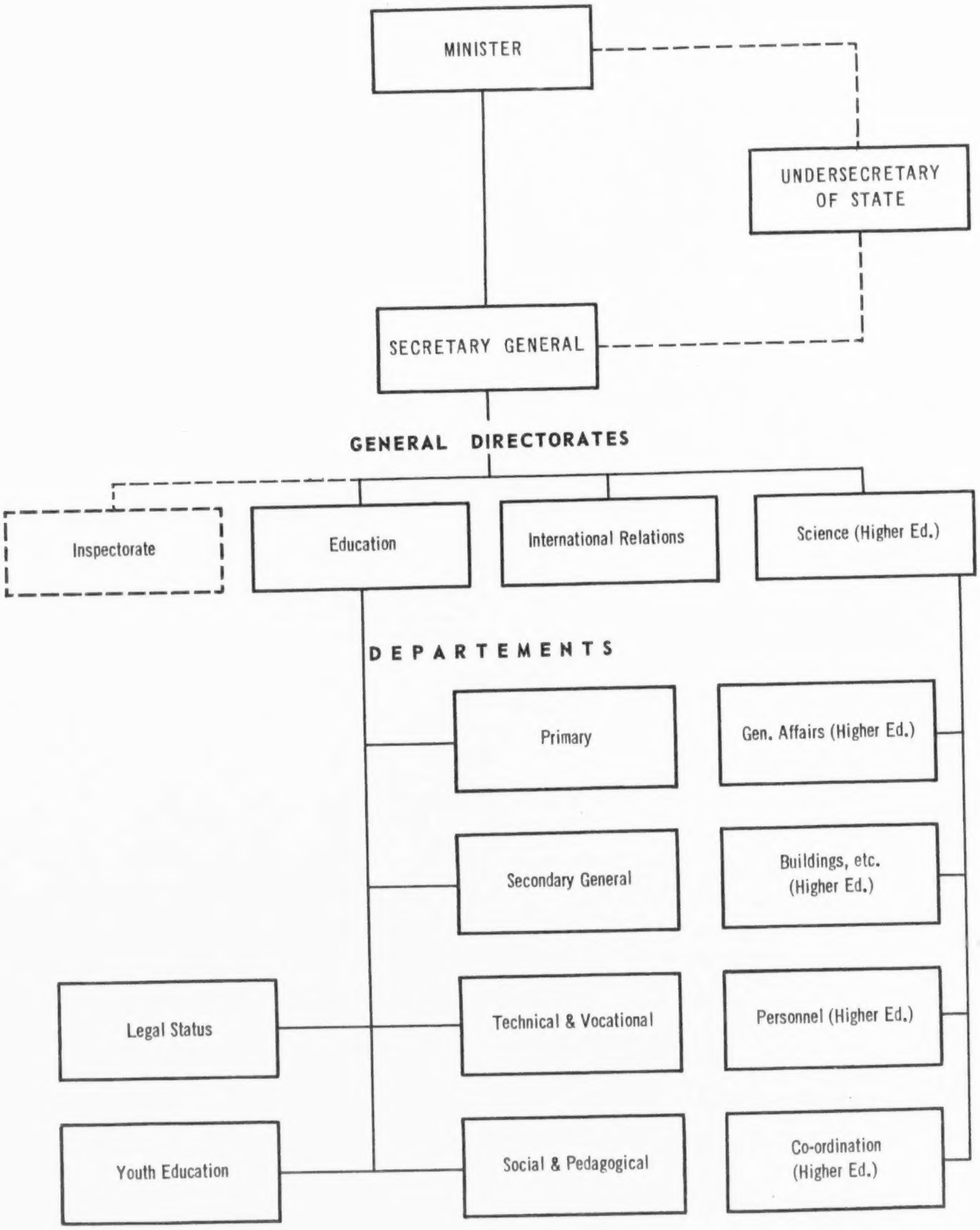
Universities and Technological Universities
Higher Technical School (HTS) (Technical College)
Middle Technical School (UTS or MTS)
Gymnasium (Grammar school)
Atheneum (Modern grammar school)
Lyceum (combined grammar school)
Higher General Secondary School (HAVO)
Middle General Secondary School (MAVO)
Apprenticeship
Lower Tech. Sch. (LTS)1
Lower Gen. Sec. School (LAVO)
Complementary Prim. Sch. (VGLO)
Bridge year
Ordinary Primary Schools (6 years)

1. Certain courses last 4 years at this level.

Appendix III

MINISTRY OF EDUCATION - ADMINISTRATIVE STRUCTURE


MINISTER
UNDERSECRETARY OF STATE
SECRETARY GENERAL
GENERAL DIRECTORATES
Inspectorate
Education
International Relations
Science (Higher Ed.)
DEPARTEMENTS
Primary
Secondary General
Technical & Vocational
Social & Pedagogical
Legal Status
Youth Education
Gen. Affairs (Higher Ed.)
Buildings, etc. (Higher Ed.)
Personnel (Higher Ed.)
Co-ordination (Higher Ed.)

Appendix IV

LOWER-LEVEL TECHNICIAN COURSES

1. Nature and number of courses available (1965)

Field	Full-time courses	Evening and other part-time courses
1. Mechanical engineering	37	13
2. Mechanical construction	-	11
3. Electrical engineering	37	10
4. Electronics	5	15
5. Electrical installations	-	6
6. Civil engineering	7	2
7. Building construction	30	13
8. Construction supervising	-	8
9. Construction draughting	1	7
10. Welding	-	2
11. Shipbuilding	-	2
12. Automechanics	4	-
13. Aeronautics	1	-
14. Aeronautical instrument techniques	1	-
15. Precision mechanics	3	4
16. Watch making	2	1
17. Chemical engineering	2	-
18. Metallurgy	-	1
19. Glass apparatus making	1	-
20. Optics and optical instruments	2	-
21. Measuring and regulating techniques	1	9
22. Painting	3	-
23. Cabinet-making	1	-
24. Machine-wood techniques	1	-
25. Wood trades	1	-
26. Upholstery	1	-
27. Textile	1	-
28. Dry-cleaning techniques	1	-
29. Press printing	2	-
30. Offset printing	2	-
31. Book binding	2	-
32. Printing	1	-
33. Engraving	3	-
34. Photography	2	1
35. Bakery and confectionery	1	-
36. Food industry	1	-
37. Jewellery	1	-
38. Gold and silver smithing	1	-
Total number of courses	159	105
Total number of schools	54	

2. Selected time-tables

(a) Link-class - Periods of instruction per week

(Common to all branches)

Mother language	4
English	4
German	4
History and geography	4
Religion	1
Human body	1
Physical training	2
Mathematics	6
Physics and chemistry	2
History of technology	1
Drawing	4
Workshop practice	4
	37

(b) Mechanical engineering course

Subjects	Instruction periods per week					%
	Semesters				Total units (1)	
	1	2	3	4		
1. General subjects					34	20
(i) Mother language	2	2	2	2	8	
(ii) English	1	1	1	1	4	
(iii) German	1	1	1	1	4	
(iv) Religion	1	1	1	1	4	
(v) Civics	-	-	1	1	2	
(vi) History of fine arts	-	-	1	1	2	
(vii) First aid	-	-	1	1	2	
(viii) Physical training	2	2	2	2	8	
2. Science and mathematics					14	8
(i) Mathematics	3	3	1	1	8	
(ii) Physics	2	2	1	1	6	
3. Technological subjects					88	52
(i) Technology of the trade	4	4	5	5	18	
(ii) Heat engines	-	-	2	2	4	
(iii) Mechanical engineering	5	5	6	6	22	
(iv) Electrical engineering	-	-	2	2	4	
(v) Technical drawing	10	10	8	8	36	
(vi) Testing of materials	-	-	2	2	4	
4. Practical work					32	20
Workshop practice	10	10	6	6	32	
Total	41	41	43	43	168	100

(1) 1 unit = 20 periods of instruction (approx.)

(c) Electrical engineering course

Subjects	Instruction periods per week-semesters					%
	Semesters				Total units (1)	
	1	2	3	4		
1. General subjects					32	19
(i) Mother language	2	2	1	1	6	
(ii) English	1	1	1	1	4	
(iii) German	1	1	1	1	4	
(iv) Religion	1	1	1	1	4	
(v) Civics	–	–	1	1	2	
(vi) History of fine arts	–	–	1	1	2	
(vii) First aid	–	–	1	1	2	
(viii) Physical training	2	2	2	2	8	
2. Science and mathematics					14	8
(i) Mathematics	3	3	1	1	8	
(ii) Physics	2	2	1	1	6	
3. Technological subjects					88	52
(i) Technology of the trade	2	2	2	2	8	
(ii) Heat engines	–	–	1	1	2	
(iii) Theory of construction	2	2	2	2	8	
(iv) Electrical engineering	5	5	8	8	26	
(v) Technical drawing	10	10	8	8	36	
(vi) Testing of materials	–	–	1	1	2	
(vii) Electrical measuring tests . . .	1	1	2	2	6	
4. Practical work					36	21
Workshop practice	10	10	8	8	36	
Total	42	42	43	43	170	100

(1) 1 unit = 20 periods of instruction (approx.)

(d) Civil engineering course

Subjects	Instruction periods per week-semesters					%
	Semesters				Total units (1)	
	1	2	3	4		
1. General subjects					34	20
(i) Mother language	2	2	2	2	8	
(ii) English	1	1	1	1	4	
(iii) German	1	1	1	1	4	
(iv) Religion	1	1	1	1	4	
(v) Civics	-	-	1	1	2	
(vi) History of fine arts	-	-	1	1	2	
(vii) First aid	-	-	1	1	2	
(viii) Physical training	2	2	2	2	8	
2. Science and mathematics					12	7
(i) Mathematics	3	3	1	1	8	
(ii) Physics	1	1	1	1	4	
3. Technological subjects					94	58
(i) Hydraulics	10	10	12	12	44	
(ii) Maritime law	-	-	1	1	2	
(iii) Technical drawing	12	12	11	11	46	
(iv) Testing of materials	-	-	1	1	2	
4. Practical work					24	15
Workshop practice	8	8	4	4	24	
Total	41	41	41	41	164	100

(1) 1 unit = 20 periods of instruction (approx.)

(e) Architecture course

Subjects	Instruction periods per week-semesters					%
	Semesters				Total units (1)	
	1	2	3	4		
1. General subjects					34	20
(i) Mother language.	2	2	2	2	8	
(ii) English.	1	1	1	1	4	
(iii) German	1	1	1	1	4	
(iv) Religion	1	1	1	1	4	
(v) Civics	-	-	1	1	2	
(vi) History of fine arts	-	-	1	1	2	
(vii) First aid.	-	-	1	1	2	
(viii) Physical training.	2	2	2	2	8	
2. Science and mathematics.					12	7
(i) Mathematics.	3	3	1	1	8	
(ii) Physics.	1	1	1	1	4	
3. Technological subjects					96	58
(i) Architecture	10	10	11	11	42	
(ii) Law education.	-	-	1	1	2	
(iii) History of building architecture	-	-	1	1	2	
(iv) Technical drawing.	12	12	12	12	48	
(v) Testing of materials	-	-	1	1	2	
4. Practical work					24	15
Workshop practice.	8	8	4	4	24	
Total.	41	41	42	42	166	100

(1) 1 unit = 20 periods of instruction (approx.)

3. Curriculum content

(a) General remarks

Some general remarks based on a publication of the Ministry of Education and Science (Training technicians, UTS, September 1965) are summarised below:

(i) General subjects

These subjects which constitute an integral part of the education required by every individual in a modern society, should also impart knowledge useful from a vocational point of view. The main objective in teaching Dutch, for instance, is to instruct the pupil how to use the language properly, both orally and in writing, whereas for German and English the aim is to impart a practical working knowledge of these languages. History, geography, and history of technology deal with matters of current interest; emphasis is placed on teaching the pupil how to use the sources from which he can learn.

(ii) Sciences and mathematics

These subjects are mainly auxiliary to technical training. Mathematics is mostly applied and supports the technological part of the curriculum. Physics is taught in a series of lectures during each of which a new phenomenon is observed and studied.

(iii) Technological subjects and practical work

Technological subjects and working practice are closely related and are taught by means of projects, each project being the focal point around which the several subjects are grouped. Small projects are worked out individually by each student while large ones are entrusted to groups of students. Students' inventiveness and initiative are greatly encouraged and the principle of productivity is emphasised. Films and organised visits to industrial firms constitute part of the training programme. Technical drawing and the teaching of the proper use of documentary material, such as folders and catalogues, form part of the curriculum for each trade.

(b) Specific areas

(i) In architectural and building trades, one of the following projects may be chosen: garden wall; brick barn; labourers' cottage; middle-class or country house; forestry buildings. Students are required to work out the project in both plan and specification form. Technological subjects include, apart from building contracts, applied mechanics and reinforced concrete structures.

(ii) Electrical engineering is divided into power-current engineering, i.e. light and power plants, electric machines and appliances, and weak-current engineering, i.e. telecommunication electronics. In the two-year course provided, tuition touches on the fundamental principles which are identical for both these fields. Electrical measurements occupy an important position in the programme.

(iii) In the mechanical engineering section special attention is given to technology and construction. Workshop exercises include the measurement and assembly of machine parts.

Appendix V

UPPER-LEVEL TECHNICIAN COURSES

1. Nature and number of courses available

Field	Full-time courses	Evening and part-time day courses
1. Mechanical engineering	15	2
2. Electrical engineering	16.	4
3. Civil engineering	14	2
4. Architecture	13	2
5. Chemical engineering	5	-
6. Physics engineering	2	-
7. Mechanical technology.	2	2
8. Textile machine engineering	1	-
9. Automobile engineering	1	-
10. Ship building	2	1
11. Aeronautics	1	-
12. Electronics	-	1
13. Electrical and tele-communication engineering	-	1
14. Measuring and regulation techniques . .	4	3
15. Refrigeration techniques	-	1
16. Geodesy	1	-
17. Building physics	-	1
18. Building contractor training	1	-
19. Town planning	-	1
20. Concrete structures	-	4
21. Chemistry	1	-
22. Metallurgy	1	0
23. Nuclear technology	-	1
24. Economics/business administration . . .	1	-
25. Business organisation	-	1
26. Supervisory training	1	-
Total	82	27

2. Courses offered and location of schools and departments

Location	Courses	
	Full-time	Evening and part-time
1. Amsterdam (Plantage Muidergr.4)	ME, EL, CHE	Nuclear technology
2. Amsterdam (Donyestraat 2)	MT, A, CE	MT, EL and Telecomm. A, CE, Concrete structures
3. Apeldoorn	Automobile engineering	--
4. Arnhem	ME, EL, A, CE	--
5. Breda	ME, EL, CHE	--
6. Dordrecht	ME, EL, CHE CE, Physical eng. ship-building economics and business administration	--
7. Eindhoven	ME, EL, Chemistry	EL, Business Organisation
8. Enschede	ME, EL	--
9. 's-Gravenhage (Princessegracht 4)	A, CE	Concrete structures
10. 's-Gravenhage (Wegastraat 60)	ME, EL	ME, EL, Electronics
11. Groningen	ME, EL, CHE, A, CE	--
12. Haarlem	ME, EL, A, CE, shipbuilding, Aeronautical eng.	--
13. Heerlen	ME, EL, CHE, A, Physical engineering	--
14. Hengelo (O)	A, CE	Concrete structures

A = Architecture
CE = Civil engineering
CHE = Chemical engineering
EL = Electrical engineering
ME = Mechanical engineering
MT = Mechanical technology

(Table 2 (cont)

Location	Courses	
	Full-time	Evening and part-time
15. 's-Hertogenbosch	ME, EL, A, CE	Construction physics
16. Leenwarden	ME, EL, A, CE	--
17. Rotterdam	ME, EL, A, CE	ME, EL, A, CE, Shipbuilding
18. Tilburg	A, CE, Textile-machine eng.	Concrete structures
19. Utrecht (Vondellaan 2)	A, CE, Geodesy	--
20. Utrecht (Oudenoord 70)	MT, EL, Metallurgy	MT, EL
21. Venlo	ME, EL	--
22. Vlissingen	ME, EL, CE	--
23. Zwolle	ME, EL, A, CE	--

A = Architecture
CE = Civil engineering
CHE = Chemical engineering

EL = Electrical engineering
ME = Mechanical engineering
MT = Mechanical technology

3. Selected time-tables

(a) Mechanical engineering course

Subjects	Instruction periods per week					%
	Years				Total units (1)	
	1	2	3	4		
1. General subjects					17	14
(i) Mother language	1	-		-	1	
(ii) English	1	1		2	4	
(iii) German	1	1		2	4	
(iv) Religion	1	-		-	1	
(v) Civics	-	1		-	1	
(vi) Applied economics	-	1		3	4	
(vii) Political science	-	1		-	1	
(viii) Physical training	1	-		-	1	
2. Science and mathematics					30	25
(i) Algebra	2	-		-	2	
(ii) Geometry, trigonometry	2	-		-	2	
(iii) Solid geometry	3	-		-	3	
(iv) Calculus (diff.-integral)	-	3		2	5	
(v) Mechanics	3	4		2	9	
(vi) Physics	3	2		-	5	
(vii) Chemistry	2	2		-	4	
3. Technological subjects					53½	45
(i) Heat engines	1	2		2	5	
(ii) Combustion engines	-	2		1	3	
(iii) Pumps	-	1		1	2	
(iv) Lifting machines	-	-		1	1	
(v) Thermodynamics	-	-		1	1	
(vi) Properties of materials	1	1		1	3	
(vii) Measuring and regulating techniques	-	-		2	2	
(viii) Mechanical technology	1	1		2	4	
(ix) Steel construction	3	3		2	8	
(x) Mechanisation	-	-		1	1	
(xi) Industrial law	-	-		1	1	
(xii) Electrical engineering	-	-		2	2	
(xiii) Technical drawing	7	7		6½	20½	
4. Laboratory work					9½	8
(i) Physics	1	1		-	2	
(ii) Testing of materials	-	1		1½	2½	
(iii) Machine testing	-	-		4	4	
(iv) Electrical engineering	-	-		1	1	
5. Practical work					10	8
(i) Workshop practice	6	4		-	10	
Total	40	39		41	120	100

(1) 1 unit = 40 periods of instruction (approx).

(b) Electrical engineering course

Subjects	Instruction periods per week					%
	Years				Total units (1)	
	1	2	3	4		
1. General subjects					18	17
(i) Mother language.	1	-		-	1	
(ii) English.	1	1		2	4	
(iii) German	1	1		2	4	
(iv) Religion	1	-		-	1	
(v) Civics	-	1		1	2	
(vi) Applied economics.	-	1		2	3	
(vii) Social law	-	1		-	1	
(viii) First aid.	-	-		1	1	
(ix) Physical training.	1	-		-	1	
2. Science and mathematics.					23	22
(i) Algebra.	2	-		-	2	
(ii) Geometry, trigonometry	2	-		-	2	
(iii) Solid geometry	3	-		-	3	
(iv) Calculus (diff.- integral) . . .	-	3		2	5	
(v) Mechanics.	3	1		-	4	
(vi) Physics.	3	1		-	4	
(vii) Chemistry.	2	1		-	3	
3. Technological subjects					38	37
(i) Technical physics.	-	1		-	1	
(ii) Electricity.	-	2		2	4	
(iii) Electrotechnical construction. .	-	-		-	2	
(iv) Electrotechnical measuring instruments.	-	1		1	2	
(v) Electrical machines.	-	2		2	4	
(vi) Electrical installations	-	1		2	3	
(vii) Electronics.	-	2		2	4	
(viii) Telecommunications	-	1		-	1	
(ix) Measuring and regulating techniques	-	-		1	1	
(x) Mechanical technology.	1	1		-	2	
(xi) Properties of materials.	1	1		-	2	
(xii) Special subjects	-	-		1	1	
(xiii) Heat engines	1	-		-	1	
(xiv) Construction	3	-		-	3	
(xv) Radio communication.	-	-		2	2	
(xvi) Electrical starting devices. . .	-	-		3	3	
(xvii) Electrotechnical drawing	-	2		-	2	

(1) 1 unit = 40 periods of instruction (approx.)

(b) Electrical engineering course (cont)

Subjects	Instruction periods per week					%
	Years				Total units (1)	
	1	2	3	4		
4. Laboratory work					13	12
(i) Electrical measuring practice. . .	-	2		-	2	
(ii) Physics.	1	1		-	2	
(iii) Testing of materials	-	1		-	1	
(iv) General measuring practice	-	-		2	2	
(v) Strong current	-	-		3	3	
(vi) Weak current	-	-		3	3	
5. Practical work.					12	12
(i) Mechanical workshop practice . . .	3	-		-	3	
(ii) Electrical workshop practice . . .	3	6		-	9	
Total.	33	35		34	104	100

(c) Architecture course

Subjects	Instruction periods per week-years					%
	Years				Total units (1)	
	1	2	3	4		
1. General subjects.			PRACTICAL WORK IN ENTERPRISES		23	19
(i) Mother language	1	–		–	1	
(ii) English	1	1		1	3	
(iii) German.	1	1		1	3	
(iv) Civics.	1	1		1	3	
(v) Physical training	2	2		2	6	
(vi) Business administration..	–	2		1	3	
(vii) Estimates and specifications. . .	–	–		1	1	
(viii) Work analysis	–	–		1	1	
(ix) Political science	–	–		1	1	
(x) Factory regulations & first aid .	–	1		–	1	
2. Science and mathematics					26	21
(i) Algebra, analytical geometry. . .	3	–		–	3	
(ii) Geometry, trigonometry.	1	–		–	1	
(iii) Solid geometry.	2	–		–	2	
(iv) Advanced mathematics.	–	2		1	3	
(v) Mechanics	4	4		3	11	
(vi) Physics, chemistry.	3	3		–	6	
3. Technological subjects.					66	54
(i) Properties of building materials.	1	1		1	3	
(ii) Mechanical knowledge for building sites.	1	–		–	1	
(iii) Architecture.	4	4		4	12	
(iv) Sewage.	–	–		1	1	
(v) Perspectives.	–	1		–	1	
(vi) History of fine arts.	–	1		2	3	
(vii) Concrete constructions.	–	2		2	5	
(viii) Steel constructions	–	1		1	2	
(ix) Auxiliary machinery	–	–		1	1	
(x) Geodesy and water supply.	–	1		1	2	
(xi) Architectural physics	–	–		1	1	
(xii) Drawing	3	3		3	9	
(xiii) Architectural drawing	7	7		11	25	
4. Practical work.					8	6
(i) Workshop practice	5	3		–	8	
Total	40	41		41	123	100

(1) 1 unit = 40 periods of instruction (approx.)

Appendix VI

UNIVERSITIES AND OTHER HIGHER EDUCATIONAL INSTITUTIONS

Location	Status	Faculties(1)	at all universities
Universities			
1. Leyden	State		
2. Groningen	"	Economics	Law, medicine, mathematics and physics, literature, philosophy
3. Utrecht	"	Veterinary	
4. Amsterdam	Municipal	Political and social sciences	
5. Amsterdam	Private (Calvinistic)		
6. Nijmegen	Private (Roman Catholic)		
Technological Universities			
7. Delft	State	(See text, para.12)	
8. Eindhoven	"		
9. Twente	"		
Agricultural Universities			
10. Wageningen	"	(See text, para.16)	
Universities for Economics			
11. Rotterdam	Private (Neutral)	(See text, para.15)	
12. Tilburg	Private (Roman Catholic)		

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(1) Certain studies are made in mixed faculties, such as sociology in the combined faculties of law, literature and philosophy; psychology in the combined faculties of literature and philosophy.

Appendix VII

TEACHER-TRAINING COURSES FOR TECHNICAL TEACHERS AT LOWER AND MIDDLE TECHNICAL SCHOOLS

1. Aims and methods

Technical teachers at lower and middle technical schools are expected to convey to the students the knowledge or skill necessary to enable them to become competent craftsmen and technicians. Their training should, therefore, provide a sound foundation in the theory and practice of teaching together with a broadening and systematisation of their professional knowledge and experience.

With a few exceptions, technical-teacher training courses are part-time evening courses and last six years at a rate of 10 to 12 lessons per week. Each course is divided into four phases as described in 2 below.

Technical teachers may also acquire the necessary qualifications through private study or correspondence courses provided they have passed the state examination (see below).

2. Content of courses

(a) Basic evening courses

(i) **Elementary phase** (two years)

This stage consists of a two-year basic course to enable teacher-trainees, regardless of specialisation, to improve their level of general education, particularly in mathematics and sciences.

The programme includes the following:

(Lessons per week)

	1st year	2nd year
Algebra	1	1
Practical geometry	1	-
Goniometry (measurement of angles)	1	1
Solid geometry	1	1
Physics	1	1
Chemistry	1	1
General technology	1	2
Applied mechanics	1	1
Dutch	2	2
English	1	1
Human relations	1	1
Total	12	12

(ii) Further basic training (two years)

At this stage streaming is introduced according to the field of specialisation. In general, two groups are formed as follows:

- training for the metal trades, e.g. fitting, plating and welding, mechanical engineering, mechanics, electrical engineering, etc.
- training for building and related trades, e.g. carpentry, masonry, painting and cabinet making.

An example of the programme taken from the metal section (fitting and manufacturing) is given below:

1st year (Lessons per week)	
Dutch	2
Pedagogical and didactic orientation	1
The Industrial Education Act, and social legislation	1
Safety regulations	1
Electricity	1
Basic higher mathematics	1
Knowledge of materials	1
Knowledge of tools	1
Drawing	2
Heat engines and tools	1
Total	12

2nd year (Lessons per week)	
Materials	2
Tools	1
Drawing	3
Sketching	1
Workshop practice	4
Constructions (Mechanical)	1
	12

(iii) Final training (one year)

Final training aims at equipping the trainee with the technical knowledge required for his trade so that the subject matter differs according to specialisation. The example below refers to fitting and machining.

	Lessons per week
Organisation of the workshop	1
Knowledge of materials	1
Machine tools	2
Technology	2
Drawing and sketching	3
Workshop practice	3
	12

(iv) Pedagogical-didactic training (one year)

The pedagogical-didactic course includes the subjects mentioned below plus 60 hours of teaching practice in day or evening schools under supervision and guidance.

	Lessons per week
Dutch language	1
Pedagogical subjects	5
Teaching techniques and visual aids	2
First aid.	2
	10

3. Alternative training courses in Amsterdam

A special full-time two-year course may be taken to replace the second year of the further basic training course (ii above) and the final training and pedagogical-didactic courses (iii and iv) above); it is run by a training centre in Amsterdam, which also offers residential facilities for second year students.
The first half of the course is spent in full-time practical training, with 36 lessons per week, while the rest is devoted to pedagogical-didactic training; during this second stage two days per week are spent in classroom instruction and three in teaching practice.

The second part of the course is also available in Amsterdam. In both Rotterdam and Amsterdam the capacity of the training courses is limited, so that the trainees have to be selected on the basis of a competitive entrance examination.

4. Fees

Tuition at the evening courses costs G.35 ($10) per year plus G.10 registration fee. Student-teachers who take their training privately or through correspondence courses pay an additional registration fee of G.30 for each examination.

Student-teachers at the full-time residential day-school in Rotterdam receive free tuition, board and lodging; trainees not in residence receive free tuition and are appointed as assistant teachers in technical schools with 95 per cent of the salary of a fully-qualified teacher as well as other benefits, e.g. sickness and accident insurance.

Appendix VIII

PRIVATE INITIATIVE IN THE FIELD OF TECHNICAL EDUCATION AND TRAINING

A. The Philips International Institute of Technological Studies (PII)

(a) The Philips concern

At present, the main interest of the Philips concern lies in the manufacture of all kinds of electron tubes and other components, as well as electronic equipment for both domestic and professional use. Measuring equipment made by Philips ranges from simple diode voltmeters to the most complex apparatus used in nuclear research.

The main administrative offices and development and research centres are in the town of Eindhoven, where are also located some of the largest of the Philips factories. The remainder of the development establishments and production plants are distributed among some 33 different towns in Holland, where new factories have been erected since the war. In addition there are a large number of sales organisations, development laboratories and production plants in many foreign countries.

On January 1st, 1959, the number of persons employed by Philips was 34,000 in Eindhoven (including 1,000 university graduates), 30,000 in other establishments in Holland, 110,000 outside Holland.

(b) Aims and objects of the PII

The Philips International Institute of Technological Studies was founded in Eindhoven in 1957. The aim of the Institute is to enable young local or foreign engineers and scientists to study for a period of one year any branch of science or technology falling within the range of Philips activities. The study system is individual; the study programme of each student is composed of a number of lectures and of practical work periods that are, as far as possible, in accordance with his preferences. The lectures are given by experts from Philips laboratories or factory departments. Students are given the opportunity to obtain practical experience in laboratories and production centres. Tuition language is the English language.

(c) Conditions for entrance

Condition for entrance is that a student has obtained an academic degree or a diploma of equivalent value. Candidates should not be older than 30 years of age; in exceptional cases the PII Management may admit older students up to 35 years of age. The Institute is primarily intended for non-Philips employees; a few Philips engineers usually attend the courses if there are places open. At the end of a student's study term no commitment exists, either for the student, or for Philips, to continue the relation. No fees are charged for study and tuition at the Institute.

Students may apply for a cost-of-living allowance during their study term; cost of travel to and from Eindhoven are not paid by the Institute. The maximum duration of a study period is one year. A diploma is granted to students that have studied at least nine months in PII; for a shorter study term, a certificate is given.

(d) Courses on electronics

A short description of the courses on electronics is given below as an example:-

The lectures on electronics are split up in two courses, i.e. an Autumn Course on "General Electronics" and a Spring Course which is centered round a specific main subject.

The Autumn Course gives a condensed treatment of some of the fundamental subjects in electronics. Students are expected to be familiar with the principles of electron tubes; no other specialised knowledge of electronics is necessary. This fundamental course is not only of interest for students for whom the subject is new, but has also proved to be useful as a general refresher course.

The Spring courses deal with one of the main subjects of electronics such as Communication Techniques, Computers, Industrial Electronics, etc., and have usually a more advanced and more theoretical character. Lectures on more practical subjects may be included in these courses, if sufficient interest exists.

It is possible for students to do some experimental work in parallel to the lecture courses. Tutorial classes during the courses and examinations at the end give students possibility to check their advances in the subjects studied.

Autumn course on general electronics (1st October - 22nd December 1962)

Transistor Physics I (9 hrs.)

Qualitative treatment of current conduction in semiconductors and through junctions.
Principles of transistors.

Theory of Amplifiers I (18 hrs.)

Tubes and transistors as active twoports.
D.C. adjustment and temperature stabilisation.
Power stages, feedback, oscillators.

Theory of Amplifiers II (12 hrs.)

Low and medium-frequency amplifiers.
Noise of resistors, tubes and transistors.

Logic Circuitry (18 hrs.)

Gate circuits, saturated amplifiers and flipflops, blocking oscillators. Core memories. Counting circuits.

Network Theory I (15 hrs.)

Introduction into network theory. Properties of two-pole and four-pole networks. Tuned circuits and bandfilters.

Modulation and Detection I (18 hrs.)

Principles of amplitude, frequency and pulse modulation. Modulator and detector circuits.

Spring course on communication techniques (11th February - 15th May 1963)

A very wide field of subjects falls under the heading of "Communication Techniques"; for this course the emphasis is given to some aspects of data transmission and to the properties of some radio transmission devices and media.

Electromagnetic Theory (4 hrs.)

Selected subjects.

Network Theory II (16 hrs.)

Treatment of network problems based on pole-zero representation in the complex plane. Analysis, synthesis, realisability conditions. Relation of Bode. Minimum phase and non-minimum phase networks.

Antenna Theory (14 hrs.)

Properties of transmitting and receiving antennae. Antenna impedance, radiation, diagram. Single and multiple-dipole antenna. Loop antenna, Parabolic reflectors.

Propagation of Radio Waves (18 hrs.)

Propagation characteristics at low, medium, high and very-high frequencies.

Transistor Physics II (10 hrs.)

Qualitative treatment of semiconductor physics. Properties of junction diodes, transistors and tunnel diodes.

Amplifier Techniques III (8 hrs.)

Amplification of wide-frequency bands and amplification at high frequencies with tubes and transistors. Noise properties.

Modulation and Detection II (14 hrs.)

General aspects of data transmission, synchronous and asynchronous systems, signalling speed, signal distortion, influence of noise, sampling, transmission of clock signals.

Error Detection and Correction (10 hrs.)

Various coding systems, correction by feedback (TOR), multilevel coding.

Transmission Theory (8 hrs.)

Influence of non-flat amplitude and non-linear phase characteristics on the signal shape. Steepness of pulses and bandwidth. Consequences of Bode's relation. Phase-equalizing networks.

Applications (10 hrs.)

A selection will be made from the following topics:
Analogue-digital conversion. Telemetering. Communication part of an Air-Seat Reservation System.

B. Shell's contribution to co-operation between Industry and Education

(Summary of a paper by J. Jansen and J.P. Werce of the Shell Company)

General Remarks

The Royal Dutch/Shell Group, known for short as "the Group" or "Shell", is interested in many fields of education. As the most international of all private enterprises, it draws on the resources of all countries for top management appointments, while it is also a major user for men with advanced professional and technical qualifications.

Shell supports the raising of local academic and teaching standards by improving the quality of teachers and by the interchange between countries of students at post-graduate level.

It also runs schools for employees' children in out-of-the-way places, promotes special studies in the interests of research, and grants scholarships. It has a vast organisation for training new-comers for their jobs.

In particular, Shell is interested in technical education as the foundation and instrument of progress, and deals with the complete range of education at university level as in Industry technical and non-technical education are complementary to each other.

Shell in the Netherlands has Operating and Service Companies. The Operating Companies have their field of activity in the Netherlands; the activities of the Service Companies cover the whole world. The Operating Companies will, among other things, base their attitude towards education on present as well as future staff needs in the Netherlands. The Service Companies base this attitude on present as well as future staff needs in and outside the Netherlands. The interest of the Operating Companies is generally in the second and to a certain extent in the third educational levels; the interest of the Service Companies is exclusively in the third level.

Shell's interests and activities in the several levels and fields of education are summarised below.

(i) Ordinary primary education

Shell provides or gives assistance for ordinary primary education only when there are special grants for doing so, or, for instance, to help pupils in the choice of a career or type of further education.

(ii) Advanced primary (lower secondary) education

The contribution of Shell to co-operation between industry and education at this level of general education is relatively small. The Operating Companies will help the educational establishments if it is a question of supplying information relating to choice of career and further studies or to information about the petroleum industry. On a broad scale, although only on request, material is provided which gives information in a popular scientific way about the oil industry.

(iii) Gymnasium and higher secondary education (HBS)

Interest in this level of general education is greater as these school leavers can be considered for clerical, technical/clerical and even technical posts; they also form the raw material for Technological and other Universities.

Shell was one of the first companies to urge the necessity of close co-operation between this class of education and industry. This led to the foundation of a "Centre for liaison between industry and education", which has since become a generally recognised co-ordinating organisation. Shell gives considerable financial support to this Centre, which organises excursions, lectures and practical weeks on a large scale for pupils in the top two classes, so that they can get an idea of industrial life and industry as a whole. Similar excursions are arranged by the Centre for headmasters, lecturers and teachers.

This Centre has recently suggested that schools in this category be adopted by firms, which would undertake to give pupils in their last year as broad a picture as possible of the problems of industrial life and industry in general. The Shell laboratory in Amsterdam has adopted a secondary school and it is not unlikely that further adoptions by other Shell companies will follow.

Shell frequently collaborates on request in providing information for special career and study guidance days organised by secondary schools. The Amsterdam laboratories hold "open weeks", usually during the Easter holidays; any pupil at the second level of education can apply to the laboratories for information during these weeks. Often chemistry and physics teachers are invited by the laboratories to come and learn about the latest technical developments.

(iv) Middle technical and vocational education

Shell's contribution to co-operation with middle level technical and vocational education takes the form of offers by Operating Companies for students to spend a short period of practical training with them within the framework of their studies. In certain cases they also assist in apprenticeship schemes. For this purpose Shell keeps in close contact with the educational institution involved about the best programme of practical work for each pupil and makes a report on the pupil's work.

If requested, information is also given to parents and pupils about the possibilities for further training in the industry.

Shell's contribution lies mainly in the field of providing its own training, the most important trades being those of operator and precision fitter.

(v) Post secondary technical education (HTS)

The various branches of the oil industry are: (1) Exploration; (2) drilling and production; (3) refining; (4) transport and storage; (5) marketing; (6) research. Of these, sections 1, 2, 3 and 6 may be called 100 per cent technical and sections 4 and 5 are technical to a more or less large extent. Graduates of technical colleges (HTS) are expected to fill posts which lie between leading and executive positions; furthermore, best students from this level of education can by experience become personnel whose field of work partly or wholly overlaps that of the university graduate.

Shell's co-operation with and contribution to this category of education is, therefore,relatively wide. All technical colleges and middle technical schools have incorporated a practical year in their curricula, which consists of four successive periods of three months work in industry. Shell's operating companies co-operate in this practical year by providing opportunities for practical work on a broad scale. In nearly all cases, these practical students come under a training division during this period of their study; this division draws up a separate programme for each student, checks that he does in fact follow it and keeps an eye on the progress he makes by means of regular reports drawn up by the student himself. In many cases the college concerned appoints a special liaison teacher, who has regular contact with the training division, has free access to the industry and is thus informed about the progress made by the student. During the practical period Shell pays an allowance.

Copies of the final report made by the student and of an assessment made by the Training Division about the student are sent to the educational body concerned.

Regular excursions to plants are arranged for technical students before they are told about a specific field of work in the presence of one or more teachers. Gifts of material for practical lessons as well as long-term loans of equipment are frequent.

Shell has made employees available to a number of technical colleges for several hours a week in order to give lessons in particular subjects, e.g. process control and instrumentation.

As concerns teachers and headmasters of middle technical schools, all operating companies organise special information days for them several times a year and arrange excursions to acquaint them with the latest developments in technique.

Shell does not restrict this practical work to the Netherlands but offers several scores of good students the possibility of doing practical work in its plants outside the Netherlands and Europe.

(vi) Science education of university standard

Shell's contribution towards education at the universities is very broad and various, particularly as far as its research laboratories are concerned. We may mention the regular scientific contacts between research workers and university professors as well as the exchange of scientific information and the giving of commissions to the universities for special research.

Professors are given the opportunity to become acquainted with the laboratories and the industry at any time, while on the other hand the research laboratories make their leading research workers available as external professors or lecturers in the universities. Assistance is frequently given with regard to post-graduate studies.

The university courses do not include obligatory practical periods in industry or industrial laboratories, but Shell co-operates without exception whenever students ask to be shown aspects of the industry, e.g. by means of excursions.

Shell has for several years now produced a brochure entitled "Careers for University graduates", which gives students relatively detailed information about the nature and the techniques used in its operations and which also sets out the possibilities offered by its organisation to graduates. This type of information is much in demand and very effective.

Shell grants a limited number of scholarships to carefully selected students, while incidentally Shell is prepared to render financial assistance to those students who on account of circumstances beyond their control would not have been able to complete their studies.

(vii) Engineering education of university standard

The remarks made under section (v) for post secondary technical education largely apply to this type of education as well.

Here, too, Shell provides full facilities for carrying out practical periods or for completing studies. Professors and students are given the opportunity of learning about the industry. Students are sent the previously mentioned booklet "Careers for University graduates" on request.

Wherever possible, Shell collaborates in making its experts available for higher engineering education, e.g. as external professors. Commissions for special research are often given as well as assistance to post-graduate studies.

Shell grants a limited number of scholarships to carefully selected students ; the Company is also prepared to provide financial assistance to students who, for reasons beyond their control, have not been able to complete their studies.

(viii) Participation in committees and contribution to capital expenditure projects

Shell participates actively in special committees which are set up for the purpose of keeping college and university technical and scientific education up to date in the development and current position of techniques and the requirements which industry lays down for its trainees.

The company contributes also financially to capital expenditure projects such as the foundation for students' accommodation, equipment and students' clubs or unions and to several other activities such as professorships, libraries, congresses, etc.

Another contribution to education is the holding of organised training programmes and courses with the purpose of developing specific oil knowledge of the employee. To this end Shell has a training organisation which, in co-operation with the functional departments, draws up training programmes ranging from the lowest to the highest level in both technical and non-technical fields.

Appendix IX

AGRICULTURAL EDUCATION

Selected time tables

1. Time table for secondary horticultural school

Subjects	Periods per week				%
	Years			Total units (1)	
	1	2	3		
(a) General subjects				41	43
(i) Religion	1	1	1	3	
(ii) Dutch.	2	2	2	6	
(iii) German	3	2	2	7	
(iv) English.	3	2	2	7	
(v) Civics	1	1	1	3	
(vi) Law.	1	1	1	3	
(vii) Physical training.	1	1	1	3	
(viii) General culture.	1	1	1	3	
(ix) Mathematics.	2	2	2	6	
(b) Special subjects				54	57
(i) Economy.	1	1	1	3	
(ii) Farm economy	-	1	2	3	
(iii) Book-keeping	-	1	1	2	
(iv) Current affairs.	1	1	1	3	
(v) Chemistry.	2	2	1	5	
(vi) Physics and meteorology.	2	2	1	5	
(vii) Botany	1	2	1	4	
(viii) Technology	1	1	2	4	
(ix) Pedology and manuring.	2	2	2	6	
(x) Horticulture	2	2	2	6	
(xi) Fruit cultivation.	2	2	2	6	
(xii) Ornamental plant growing	1	2	2	5	
(xiii) Phytopathology	2	-	-	2	
Total.	32	32	31	95	100

(1) 1 unit = 40 periods of instruction (approx.)

2. Time tables of a higher (secondary) agricultural school

Subjects	Periods per week						Total units (1)	%
	Semesters							
	1st grade		2nd grade		3rd grade			
	W	S	W	S	W	S(2)		
(a) General subjects							53	25
(i) Dutch	2	2	1	1	1	–	7	
(ii) English	2	2	1	1	2	–	8	
(iii) German.	2	2	1	1	1	–	7	
(iv) French.	2	2	1	1	1	–	7	
(v) History	2	1	–	–	–	–	3	
(vi) Geography	2	1	–	–	–	–	3	
(vii) Civics and law.	1	1	–	–	–	–	2	
(viii) Sociology	–	–	1	1	1	1	4	
(ix) Drawing and arts.	1	1	1	1	–	–	4	
(x) Physical training	2	2	1	1	1	1	8	
(b) Basic vocational subjects. . . .							62	29
(i) Mathematics	3	2	3	3	–	–	11	
(ii) Chemistry and technology. . .	4	3	3	2	3	2	17	
(iii) Physics and meteorology . . .	4	3	3	2	3	2	17	
(iv) Botany and genetics	2	3	2	2	–	–	9	
(v) Zoology	2	2	2	2	–	–	8	
(c) Special subjects							95	46
(i) Geology	1	1	–	–	–	–	2	
(ii) Pedology.	–	2	1	1	1	1	6	
(iii) Land development.	–	–	–	–	2	2	4	
(iv) Geodesy	–	2	–	2	–	–	4	
(v) General plant growing	2	2	1	–	–	–	5	
(vi) Special plant growing	–	–	–	2	2	3	7	
(vii) Manuring.	–	–	2	1	2	2	7	
(viii) Agricultural engineering and labour conditions	–	–	3	3	3	3	12	
(ix) Technical drawing	–	–	1	1	2	2	6	
(x) Animal husbandry	1	1	2	2	2	3	11	
(xi) Hygiene	–	–	–	–	2	2	4	
(xii) Livestock feeding	–	–	1	1	2	2	6	
(xiii) Lactology and dairying. . . .	–	–	1	1	1	–	3	
(xiv) General economics	1	1	1	1	–	–	4	
(xv) Farm economics and farm management.	–	–	1	2	3	4	10	
(xvi) Book-keeping.	–	–	2	1	1	–	4	
Total	36	36	36	36	36	30	210	100

(1) 1 unit = 40 periods of instruction (approx.)
(2) W = Winter, S = Summer.

Appendix X

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Appendix XI

SELECTED LIST OF INDIVIDUALS AND ORGANISATIONS CONSULTED

1. Ministry of Education and Sciences
   - (i) Division of International Relations (Mr. Van der Gaag, Mr. Van Riet).
   - (ii) General Directorate of Technical and Vocational Education (Mr. Jansen, Mr. Bouricious, Mr. Uhl).
   - (iii) Inspectorate for Technical and Vocational Training
     Mr. H. Verment - Higher Technical Schools
     Dr. G. Slot - Intermediate Technical Schools
     Mr. Segaar - Lower Technical Schools
     Mr. Bosch - Technical Teacher Training
   - (iv) Research and Planning Department (Mr. Ir't Zandt, Deputy Director).

2. Ministry of Social Affairs and Public Health
   - (i) Division of Vocational Training (Mr. P. Harrijvan)
   - (ii) Research Bureau of the State Labour Office (Mr. L. Niesten).

3. Ministry of Agriculture and Fisheries

   Directorate for Training and Education (Ir. C.A.P. Van den Hout, Inspector).

4. Ministry of Economic Affairs

   Division for Training and Examinations (Dr.A.L. Dirken).

5. Central Bureau of Statistics

   Cultural Statistics (Mr. Schoonheim).

6. Central Planning Bureau
   Education and Manpower (Mr. Ruiter).

7. Several Technical Schools

8. BEMETEL, Foundation for Vocational Training in the Metal and Electrotechnical Industry (Mr. Handebeck, Director).

9. SVB, Foundation for Vocational Training in Building Construction (Dr. W. C.S. Laman Trip, Director).

10. Central Organisation of the National Apprenticeship Boards (Dr. W.C.S. Laman Trip, Chairman).

11. KIVI, Royal Association of Engineers (Koninklijk Institut van Ingenieurs) - (Ir.I. Ligthart, Secretary General).

12. NIRIA, Netherlands Institute of Registered Engineers and Graduates of Higher Technical Schools (Mr. Vervoort, Secretary).

13. NVV, Netherlands Verbond van Vakvereningingen (Trade Unions) - (Mr. I. Velema, Secretary for Non-manual Workers, in charge of Educational Matters).

14. Hoogovens Steelworks (Mr. Reeper, Director of the Training Centre).

15. Horecaf Hotelschool (Mr. Bartema, Director).

Appendix XII

CONCLUSIONS OF THE CONFRONTATION MEETINGS

A: Confrontation Meeting between the Netherlands - Spain - Switzerland - Yugoslavia

1. The discussions followed the procedure adopted in the previous confrontation meeting between Canada and Denmark, the main conclusions of which were adopted by the meeting. These conclusions are incorporated here as Part B of this Appendix for the sake of easy reference.

2. The participation of a large number of countries with different systems and methods and the availability of completed reports on these countries made the discussion extremely profitable and lively and brought to light issues which had not appeared before. A brief account of these new issues as they have been discussed under the various agenda items is given below.

(a) Standardised qualifications

3. It appears that an attempt to set international standards as regards technician training courses will not lead to any valid results, because of the existing great differences in structure and content of these courses in the various countries. However, it would be useful to define the minimum qualifications required for each grade so as to devise a yardstick against which one could measure and evaluate the situation in each Member country.

(b) The technician force

4. In most cases technician courses aim at the production of middle level technical manpower to fill in existing gaps in the rapidly developing economy. It should be emphasised, however, that in the case of countries in the process of industrialisation, availability of such a technical force might play a decisive role in the establishment of new industrial concerns and be a prerequisite to set developing industry on a sound and competitive basis.

5. When planning for technical education it is important to know, among other things, the appropriate ratio: university engineer/higher technicians. Although this ratio may vary from country to country, depending mainly on the nature of industry, it is observed that in the majority of cases, a higher technician force three times larger than the respective engineering force will be required to support and supplement effectively the latter.

6. It was observed that in all four countries under examination there was a scarcity of higher technicians. Among the reasons given for this scarcity, the following, although not always universally applicable, are worth noting:

(i) Inadequate supply of information to parents and prospective students, as regards technician studies and careers, due to lack of properly organised and functioning educational and vocational orientation and guidance service.

(ii) The role of higher technicians in industry is not, in all cases, well defined and appreciated. The social and professional status of the technician is still vague and in many cases technicians are still considered as "second class" engineers.

(iii) Promotion possibilities through further studies are, in certain cases, extremely limited. Although the vast majority of technicians are expected to enter the "economy" directly, provision should be made for those who have the ability and interest to be enabled to continue their studies for higher qualifications.

(iv) The educational system is finding it extremely difficult to keep pace with the constantly increasing demand of a rapidly developing industry.

(v) Lack of reliable statistical data on present and future needs in technical manpower do not permit effective planning in the educational field.

(c) Technician training courses

7. When using the term "apprenticeship" one should have in mind that it does not necessarily refer to craft training only. There are countries, such as the United Kingdom, where apprenticeship training covers the whole range of technical force from the skilled worker up to and including the university engineer.

8. Although school-training is indispensable it should be realised that it has its limitations. Therefore, training within industry should constitute an integral part of the technician training process.

9. It was agreed that there are at least two possible ways of training in order to ensure desirable adaptability of the "end product" to the continuously changing needs of modern technology:

(i) To give narrow and deep specialisation providing for retraining possibilities on similar bases, as might be proposed by a special "retraining committee";

(ii) To train on a broad scientific and technical background allowing for further specialisation within industry. Special short courses on new developments and techniques may be organised by the technical colleges in collaboration with industry. It appears that the latter method of training gives better results as regards both the quality and adaptability of technical personnel and is therefore highly recommended.

10. As technology is developing at a rapid pace it does not appear feasible for the educational system to keep abreast of it. Therefore industry is expected to react first by providing necessary training

courses, which may then be adopted and further developed by the technical colleges.

(d) Co-ordination of efforts in the training process - industry participation

11. The establishment of a co-ordinating mechanism charged with policy making and all other matters related to technical education and training is considered of vital importance, no matter what the social and political structure of the country is. Such a mechanism should be composed of representatives of the educational authorities, the teaching force, other governmental and private institutions participating in the training scheme, employers' and employees' associations and industry.

12. Under Item 5 of the agenda the several forms of participation of industry in the training process were thoroughly discussed. It was agreed that active participation of industry, including jointly financed (industry/educational authorities) training programmes, is of vital importance and positively contributes to the development of technical education and training. Reference was also made to the pattern of co-operation between industry and education developed recently by the United Kingdom (Technical training, under the Industrial Training Act, 1964).

13. Participation of industry representatives in a central co-ordinating mechanism (see under 11 above), in technical school boards and examination boards and the establishment of jointly financed (government and industry) training programmes are considered as realistic measures to secure the desirable active participation on its part.

(e) Recruitment and training of technical teachers

14. In the discussion of the problem of recruitment and training of technical teachers, it was revealed that all four countries experience much difficulty in securing in adequate numbers properly qualified

personnel to cope with modern industrial and educational requirements.

15. In order to be efficient in his job, a technical teacher should possess adequate knowledge in a variety of subjects. Technical knowledge and experience should be supplemented by pedagogical training covering child and adult education, psychology of the trade, labour market problems, industrial organisation and financing, productivity, etc. Such knowledge can only be acquired through special training which should, therefore, be regarded as part and parcel of the technical teacher training process.

16. Entrants from industry to teaching, lacking pedagogical training, frequently experience great difficulty in performing teaching tasks. Often they have to learn by trial and error and the students suffer from their initial ignorance of efficient teaching methods. On the other hand, experience of certain countries shows that, as a general rule, adult personnel originating from industry are rather reluctant to readjust themselves to school conditions and be exposed to formal training.

B: Confrontation meeting between Canada and Denmark

(Revised version)

(a) Delineation of the category of skilled labour force under consideration

17. It was agreed that a "scholastic" definition of the technician should be avoided. The force under consideration was defined as that which lies between the skilled worker at the one end and the professional engineer at the other.

18. It was decided that although discussions should be focussed on engineering technicians, as information available was mainly in this field, technicians in other fields should also be covered as adequately as possible.

(b) Level of technicians - certification - training

19. It was agreed that the technician force should be classified in two main levels, provisionally termed the junior or lower technician level and the senior or upper technician level. The classification should be based not on functional assignments but on educational qualifications which need not necessarily be acquired in a formal way.

20. The titles used to define the various levels of technical personnel vary from country to country. In Denmark lower level technicians are defined as "technicians" or "technical assistants" while in Canada the term "technologist" is used for the upper level and the term "technician" for the lower. University engineers are defined as "engineers" or "professional engineers" in Canada and "civil engineers" or "academy engineers" in Denmark.

21. Difficulty was experienced in comparing the training programmes of the two countries because of differences in basic principles. The Danish system is mainly based on apprenticeship training while the Canadian is entirely institutional. After discussion it was agreed that though apprenticeship should not be a prerequisite for technician training a period of practical training in industry is essential. The Danish authorities have already realised this fact and are planning to reduce the apprenticeship period preceding technician training.

22. By comparing the "Teknikum Engineer" of Denmark with the "Technologist" of Canada it became evident that senior Technician training should be a standardised post-secondary training of a less theoretical but positively more practical character than the university level training in parallel fields.

23. By studying the fields of activity of Junior technicians it was agreed that Junior technician training programmes should be of a flexible character and duration, and should be particularly adapted to the needs of the individual trade in each country. A basic general education of at least 10 years was considered an essential prerequisite for the production of an adaptable "end product". This educational

background together with the additional education and training acquired through the course proper, should bring the junior technician to an educational level comparable to that of a full secondary education.

Specific training programmes were further discussed on the basis of an illustrated exposé (projection of slides) by the Danish Delegation.

24. Standardised certification, already well ahead in Denmark, was considered essential not only at national level but also internationally. OECD was invited to assist Member countries in this respect.

(c) Vocational Guidance Service - Wastage from technical courses

25. Study of relevant information revealed that vocational guidance services in both countries are not adequately organised. It was decided that further steps should be taken to establish effective services in both the vocational guidance and the vocational selection fields.

26. Wastage from Senior Technician and University courses appeared to be a major problem, particularly in Canada. Many factors seem to influence this wastage; undoubtedly among them is the inadequate method of vocational guidance and selection.

It was decided that further investigation should be undertaken to define (i) the reasons for high wastage, (ii) what happens to the "drop-outs".

(d) Recruitment and training of technical teachers

27. In both countries recruitment of technical teachers presents difficulties because of the scarcity of properly qualified personnel and the competition from industry.

28. It was agreed that a technical teacher should:

(i) possess qualifications ensuring thorough theoretical and practical knowledge of the subject he is expected to teach;

(ii) have industrial experience in appropriate fields;

(iii) be familiar with basic educational principles and possess adequate knowledge of teaching methods and techniques;

(iv) be kept continuously aware of new developments in the educational and the industrial fields.

It was agreed that to ensure this, this represented an important area where further government action was necessary. OECD was invited to assist the countries in this field.

29. The possibility of securing part-time services of personnel from industry was discussed. It was agreed that this procedure though difficult to put into practice, at least so far as day courses are concerned, should be further explored; in effect it encouraged the person involved to keep continuously up to date in both the theoretical and the practical fields.

30. Further discussion led to the conclusion that a reciprocal flow from industry to education and vice-versa is highly desirable. To ensure this, establishment of rules for recognition of a "continuity of service" (years of service, pension, etc.) would be necessary. In Denmark this problem is being tackled by the technicians' professional association.

31. Discussion on the status and salaries of technical teachers revealed that authorities in charge should be advised to work out salary scales, pension allowance, etc., competing with those in industry.

(e) Authorities in charge of technical and vocational education - Co-ordination of efforts

32. Provincial autonomy in Canada creates a special situation and makes comparison with Denmark or some other European countries difficult. Discussion led to the conclusion that although a decentralisation is for several reasons advisable, the existence of a central

co-ordinating authority is indispensable to ensure the requirements of sound educational policy at national level and the desirable standardisation of qualifications as a pre-requisite for internal mobility.

(f) Status of technicians and their careers

33. An examination of the information available led to the conclusion that at present two types of technicians exist in each country, i.e.

(i) Those classified as technicians by virtue of their educational qualifications;

(ii) Those who because of their experience and aptitude perform duties of technicians, regardless of their formal qualifications.

The latter category however was created in each case to meet the urgent requirements of the rapid industrial expansion with which the provision of educational facilities could not keep pace; this category is gradually fading out in both countries.

34. Discussion on the organisation and functions of technicians' professional associations led to the conclusion that the establishment of such associations should be encouraged as they greatly contribute to the social recognition of the professional status of this category of skilled personnel. The successful example of Denmark should encourage other countries to proceed in the same direction.

35. Discussion on the earnings of technicians in industry revealed that these largely depend on the personal ability of the individual and in some cases are higher than those of the professional engineers.

36. The limited possibilities existing in the two countries for promotion from skilled worker to Junior Technician to Senior Technician was shown to be a feature of the present situation. However, in Denmark, it appears that Teknikum Engineers have many more opportunities, as compared to their Canadian counterparts (technologists), to undertake managerial or technical jobs, normally requiring an engineering degree, in industry.

37. It is recommended that promotion from one skilled category to another through further studies be encouraged and facilitated through inter-relating the structure and content of the training programmes. However, it should always be kept in mind that training for each skilled category is an entity in itself and cannot be regarded as part of another; consequently, unnecessary distortion of training programmes for the sake of continuity and transferability should definitely be avoided.

(g) Availability of statistical data

38. In both countries the availability of statistical data enabling the planning and implementation of technician training programmes is inadequate or does not exist at all. It was decided that efforts should be made to secure such data, mainly based on the real needs of industry and not on the available capacity of the educational establishments. However, one of the main difficulties in estimating the needs of industry in skilled manpower was the hesitation of industry itself to make any firm statement as regards future needs. Research and Development Services were usually found to be more reliable sources for such information.

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